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THE JUNIOR COLLEGE HAS EMERGED AS THE APPROPRIATE TRAINING AGENCY FOR STUDENTS ENTERING MIDDLE MANPOWER JOBS REQUIRING A BALANCE OF COGNITIVE AND MANUAL ABILITY. THESE ARE THE STUDENTS WITH MIDDLE LEVEL ABILITIES AND ACCOMPLISHMENTS, FOR WHOM HIGH SCHOOL EDUCATION IS NOT ENOUGH AND A 4-YEAR DEGREE NOT NECESSARY. PROBLEMS ENCOUNTERED IN TRAINING THEM FOR SUCH OCCUPATIONS ARE THE STUDENTS' LACK OF SENSE OF STATUS, THE UNCERTAIN PLACE OF SUCH JOBS IN A CORPORATE ORGANIZATION CHART, LACK OF SOUND COUNSELING, CONTINUING HIGH SCHOOL EMPHASIS ON COLLEGE PREPARATION, AND A SHORTAGE OF TEACHING AND ADMINISTRATIVE PERSONNEL. IMMEDIATE RESEARCH IS NEEDED ON (1) THE REAL ENTRY REQUIREMENTS OF INDUSTRY, (2) THE APPRENTICESHIP SYSTEM, (3) TRAINING PROGRAMS IN INDUSTRY, (4) STATUS AND PROPER USE OF TECHNICIANS, (5) THE SUITABILITY OF VARIOUS INSTRUCTIONAL MEDIA, (6) THE VALUE OF GENERAL EDUCATION COURSES, (7) OPEN-ENDED CURRICULA FOR JOB ENTRY OR TRANSFER, (8) PREPARATION OF COMPETENT INSTRUCTIONAL STAFF, (9) A POSSIBLE FIRST-YEAR CORE CURRICULUM FOR TECHNICIANS, (10) REGIONAL PRETECHNICAL PROGRAMS IN HIGH SCHOOLS, (11) WAYS TO UPGRADE THE TECHNICIAN'S STATUS, (12) THE ECONOMIC VALUES OF THE TECHNICAL PROGRAM, (13) THE USE OF DATA FROM FOLLOWUP STUDIES, (14) EFFECTS OF AUTOMATION ON JOB REQUIREMENTS, AND (15) A NEW OCCUPATIONAL CLASSIFICATION SCHEME WITH A MORE PRECISE DEFINITION OF THE TECHNICIAN. (HH)

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NEW DIMENSIONS
IN HIGHER EDUCATION

Number 23

DEVELOPMENTS IN TECHNICAL AND VOCATIONAL EDUCATION

by Norman C. Harris

Everett H. Hopkins, Editor

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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FOREWORD

(If and when this manuscript is published for general distribution, the Editor will gladly prepare an appropriate Foreword for the wider audience.)

HIGHLIGHTS

The essential purpose of the monograph is to give a status report, as of the mid-1960's, on the role of higher education in middle manpower development. The spectrum of "middle manpower" is defined as consisting of those jobs with a balance of cognitive and manual content which lie between the recognized professions on the one hand, and the manual skill occupations on the other.

1. The age-old dichotomy between the liberal arts and the practical is reviewed; followed by an analysis of the changes in science, technology, politics, and society to demonstrate the utter incompatibility of a medieval philosophy of higher education with the America of today. Frequent references to the literature of the philosophy of education are made, as well as to recent research results and conference reports related to the fields of manpower, automation, and technology.

2. The author provides a detailed analysis of the middle manpower occupations in several fields--industry and engineering, science and research, business, health, agriculture, and the public and private sector service occupations.

3. The kinds of colleges and post-secondary schools engaged in technical-vocational education are described in considerable detail. Past performance, present status, and future promise of such institutions as the junior college, the technical institute, and university branches are analyzed. Military schools and industry-training programs are also considered. The essential conclusion is that, although all of these kinds of schools are needed and all are making a significant contribution, it is the community junior college which now and in the future will be the major collegiate institution for middle manpower development.

4. The author identifies a number of current and recurring problems which continue to plague collegiate-technical education: (a) status problems--both the status of the jobs themselves, and the status of the educational programs; (b) weaknesses in guidance and counseling programs; (c) the fact that the American high school still lives painfully with the academic--vocational dichotomy; (d) faculty

shortages for technical-vocational fields; and (e) reluctance to depart from traditional teaching-learning procedures--the "standard classroom" syndrome.

5. Suggestions are made for needed research and needed action programs. Emphasis is placed on the latter. Much of the research of the past few years has been useless except as exercises for the training of researchers. What is needed is research which has applicability to the problems for which solutions are needed now.

I. INTRODUCTION AND RATIONALE

To the extent that a single word can characterize a movement, the word "controversy" comes to mind in connection with technical-vocational education. There is controversy over method, over degree of specialization, and over age level of students; there is disagreement over what type of school can best provide vocational education to youth and adults; there is heated debate over the merits of general education in occupational education programs; and indeed there are many articulate and respected spokesmen, both educators and laymen, who contend that vocational education is at best transitional and at worst useless in modern technological society. There are many who strongly believe along with Aristotle that "the aim of education is the wise use of leisure."

Dualism in education is still with us. The liberal arts, though somewhat more inclusive than the original seven of Cicero's time (and in the minds of some, now more than a little diluted and tainted by 20th-century infusions), still constitute the generally accepted body of knowledge with which colleges are expected to concern themselves; and the practical arts, though they may be tolerated out of economic necessity, are relegated to "country-cousin" status by the more genteel members of the higher education family. It is intellectually respectable to study and deliberate about Democritus' primitive notions of the structure and behavior of matter, but somehow it is less than respectable to study ways in which electrons can be controlled to serve man's needs. It is within the accepted context, even in the best tradition of higher education, to review and emphasize the contributions of Euclid to geometry, of Archimedes to physics, or of Newton and Leibnitz to the calculus, and to minimize the contributions of engineers and technicians of today who have in a few decades made greater progress in the actual solution of multivariable mathematical and physical problems than was made in the three millennia before them. Briefly, let us examine the basic sources of dualism in education before turning to the central theme of this section which is the role of higher education in manpower development.

Educational dualism has its roots in Greco-Roman times. The idea that higher education was for the few is rooted in the dualism of ancient societies, where "freemen" were few and slaves were many. Plato's Republic envisions three social classes--guardians, warriors, and workers (or slaves). Guardians were freemen, those whose economic status allowed them the leisure to study and deliberate, and whose political status gave them the authority to proclaim the law and fashion the government. It was for the guardian class that "liberal" education was intended. The Latin root liber, meaning "free," gives the clue to the original meaning of liberal education. It was education for the "free" man, the leisured man, the ruling class, as contrasted with the "practical arts," which were intended for the working classes and slaves. Epictetus is credited with saying that "only the educated are free." This is a noble thought, but in his time it would have been more nearly correct to have said, "Only the free are educated!" It is significant to note that the members of the leisure class of ancient Greece did apply themselves so diligently to study and schooling that their word for leisure translates to our modern (Western) words for school.[1]

Originally the content of the liberal arts consisted of the disciplines of grammar, rhetoric, and logic, a group known as the trivium. Later four other disciplines acquired respectability and were one by one brought into the fold of the liberal arts. These four, the quadrivium, were arithmetic, geometry, music, and astronomy. By the twelfth century A.D. the accepted studies of higher education were known as the seven liberal arts, and although modification and expansion, branching and bunching, new discoveries and new problems have in the intervening centuries filled college catalogs with hundreds of separate courses, the old dualism still exists to this day. The liberal arts are respectable--they are for the "good students"; the practical arts are somehow less than respectable, and in the opinion of many do not belong in colleges at all.

Today, in America all men are free and almost all men work, but we persist in assigning high status and first priority to studies originally intended for leisured, privileged man, while low status and second priority are assigned to studies which have become essential to free, economic man. Controversy continues unchecked--the dichotomy is far from dead.

Higher Education and Manpower Development

One of the currently popular arguments directed against technical-vocational education centers on its alleged obsolescence. A major area of controversy is concerned with the real applicability of vocational education in an era of rapid technical change. Some examination of this thesis is in order.

The technological revolution, though dramatic in its sweep, encompassing the development of the flow-process industries, automation, and the application of the electronic computer to problems ranging from steelmaking to "matchmaking," has been dramatized by many writers. Looking with awe at automation has become so fashionable that one has to be almost brash to ask that considered reason and a hard look at the present replace flights of fancy and distant looks into the future. We can look backward 30 years and marvel at the changes technology has wrought; and we (quite correctly) assume that in the next three decades the pace of change will be even more rapid: that job demands will change, that old jobs will disappear, and that jobs we now cannot even imagine will occupy a large share of the labor force. But some "experts" seem to forget that past and future are linked by the present, and that present needs must be met even before trying to anticipate future needs.

Extrapolating beyond "hard" data and drawing conclusions more from a sense of drama than from mundane reality, some writers (and indeed many educators are numbered among them) are blowing the whistle on occupational education of all kinds. "How can you plan vocational education for jobs which don't even exist yet?" is a favorite rhetorical question. W. H. Ferry, vice president of the Center for Democratic Institutions at Santa Barbara, California, has recently declared that "it is nonsense to train men and women for disappearing occupations." And in apparent derogation of a competitive, work-oriented economy, Ferry continues: "It is impractical and dangerous to teach competition when cooperation is the price of survival."[2] Kurt Lewin is, of course, famous for his quip that "there is nothing as practical as a good theory," which is hailed by academicians as nailing down the coffin lid on vocational education.

There has been a spate of speeches emanating from the avant garde cyberneticists expressing dire predictions that machines will take over almost all skilled and semiskilled work as we know it today; that even semiprofessional and managerial workers will be relegated to the scrap heap of idleness as the computer invades the domain of human brain power. Frightening specters of mass unemployment have been conjured up, and, having convinced themselves that "work" will be hard to find, some philosophers and sociologists are now proclaiming that the "work ethic" itself is passe, that work as a moral obligation to contribute to one's society is an archaic theme, and that man's seeing his identity and achieving his sense of personal worth through work are concepts to be flushed down the 20th-century drain along with other leftover effluents from a horse-and-buggy society.

Yet as one takes a realistic look at the American economy and its occupational structure at this point in time the "dangerous iceberg of the new technology"[3] hardly seems so grim and fearsome as some alarmists would have us believe. Indeed, there are some persons who take a sharply opposing view--who would regard the "dangerous iceberg" as a beneficial ice cube in a stimulating economic cocktail. In general, labor leaders, joined by some sociologists, philosophers, and economists, take the "dangerous iceberg" view; while management, joined by some other economists and by most fiscal and trade experts, take the "ice cube in the cocktail" view.

Which group of "experts" should educators believe? Is economic productivity being held back by a lack of vocational education and by a dearth of proper skills in the work force, or are technical-vocational education programs just exercises in futility, mere dust devils in the cybernetic hurricane of our times?[4] Some of those who see through the glass darkly and cry "Iceberg ahead!" have been quoted in the foregoing. Let us cross to the other wing of the bridge and sample the reports from other "lookouts" on the economic scene.

No more prestigious group of national leaders has been assembled in recent years than the members of the National Commission on Technology, Automation and Economic Progress. The report of the commission[5] is one of the most incisive and reasoned documents available on the subject of technology and economic progress. The first chapter is entitled "The Pace of Technological Change," and the commission's consensus on this topic is important enough to justify a rather lengthy quotation here. The chapter opens with the following statements:

> It has become almost commonplace that the world is experiencing a scientific and technological revolution. Stock

> phrases--knowledge explosion, second industrial revolution, automation revolution--express this belief. According to one extreme view, the world--or at least the United States--is on the verge of a glut of productivity sufficient to make our economic institutions and the notion of gainful employment obsolete. We dissent from this view.... (Emphasis added.)
>
> There is no doubt that the pace of technological change is uneven from decade to decade and century to century. Past trends and current prospects suggest that the present is, and the near future will be, a time of rapid technological progress.... But this is as far as we are prepared to go. It is beyond our knowledge to know whether the computer, nuclear power, and molecular biology are quantitatively or qualitatively more "revolutionary" than the telephone, electric power and bacteriology.
>
> Our study of the evidence has impressed us with the inadequacy of the basis for any sweeping pronouncements about the speed of scientific and technological progress. There are, however, a few measurable aspects of the process about which reasonable statements can be made. Our broad conclusion is that the pace of technological change has increased in recent decades and may increase in the future, but a sharp break in the continuity of technical progress has not occurred, nor is it likely to occur in the next decade. (Emphasis added.)

After analyzing at length the influence of education and skill on employment and unemployment the commission had this to say:

> There is ample justification for increased education and training efforts. Quite aside from the purely personal cultural aspects of education, the level of training and skill affects the overall efficiency of the economy and the flexibility of the labor force, as well as the relative place in line of labor force members. In recent years, economists have produced evidence that the rates of return for investment in education are comparable with those earned on other investments. And cost-benefit analysis of training programs

> under the Manpower Development and Training Act have shown that the strictly economic returns alone were large enough to pay for the investment.
>
> But a sharp distinction is necessary: The individual's education and skill are important determinants of his relative ability to compete for jobs. The education and skill of the labor force is important to the economy's viability. Technology determines, in part, the skills required and the education component of those skills. But the availability of skills and the educational level of the labor force are also determinants of the technological changes which occur. Together, education, skill, and technology, along with other factors, determine the structure of employment and unemployment. They do not determine the level of either.[7]

For a major section of the same report devoted to the impact of technological change during the next 10 years the commission requested the Bureau of Labor Statistics of the United States Department of Labor to project U.S. manpower requirements to 1975.[8] Based on assumptions that (1) no major economic depression will occur, (2) no major (world) war will occur, (3) and that public policy will be oriented toward a joint private sector--public sector economy, the projections and findings of the BLS study included all of the following:

1. The number of persons gainfully employed will increase by about 1.7 annually, to a 1975 labor force of 88.7 million persons.

2. The only major "industry sector" in which a decline in employment is expected is "farm employment," in which a decline of about one million workers is expected in the decade.

3. "Goods-producing" industries' manpower requirements are expected to increase by 17 percent, and the "service-producing" sector (i.e., trade, finance, government service, transportation, and public utilities) labor force is expected to increase by 38 percent. By 1975 the "goods sector" will involve about 36 percent of the labor force, and the "service sector" 64 percent, continuing a trend which began in the late 1940's.

With regard to the impact of technological change, the commission (interpreting the BLS report) had this to say:

> Concern has been expressed that the impact of technological and industrial change will drastically curtail employment opportunities for less skilled workers. The principal conclusion of the BLS study which takes into account the major technological changes in American industry that can be identified and makes a careful appraisal of their potential effects on employment, is that overall demand for less skilled workers will not decrease over this 11-year period, although it will decline somewhat as a percentage of the total. (Emphasis added.)

The importance of college-level education and training for the occupational changes brought on by technological change is borne out by the following conclusion from the commission's report:

> The greatest increase in employment requirements will be for professional and technical workers; more than 4.5 million additional personnel will be required. The white-collar group as a whole is expected to expand by nearly two-fifths, and to constitute 48 percent of all manpower requirements by 1975.

> The blue-collar occupations are expected to expand at less than half this rate and will make up about 34 percent of all requirements. A rapid expansion in requirements for service workers is indicated--a 35 percent increase in employment.[10]

It is evident, therefore, that many persons close to manpower problems--persons whose daily work is the study of occupations and the impact of change on jobs and on the labor force--do not share the alarmist view that we are "hoist on our own petard" of technological advancement. The "realist" view, if it could be so described to contrast it with the "alarmist" views of those persons cited on earlier pages, could be summarized in part by the following statements:

> There is indeed a steady increase in the pace of technological change, the most useful measure of which is the annual growth of output per man hour in the private economy. The rate of increase in output per man hour during the first half of the 20th century was about 2 percent per year; since 1950 it has been about 3.2 percent per year. Such growth is healthy, keeps the American economy in a competitive position in world markets, enhances the American standard of living, and encourages continual improvement of the work environment.
>
> Technological change does indeed play a role in selective unemployment--it determines in a sense who will be displaced--but there is little realistic basis either past, present, or future for the "dangerous iceberg" concept of technological change. One is reminded, in this connection that, if it were not for the "new technology" in the telephone industry, and if current telephone message traffic had to be handled by the "Number, please" operators of a few decades ago, nearly every woman in the labor force would have to work for a telephone company!
>
> There is little or no evidence that there will be in the

> next decade an acceleration in technological change so rapid that the balance between productivity and economic demand will be seriously disturbed. This prediction could be affected, of course, by national monetary policies.
>
> Education and training (both the liberal arts-academic kind, and the vocational-technical kind) will be essential to the continued viability of a democratic society and of the national economy. In the words of the National Committee on Technology, Automation and Economic Progress, education in part "determines the employability and productivity of the individual, the adaptability of the labor force, the growth and vitality of the economy and the quality of the society.[11]

The commission took a strong position in support of technical-vocational education. Among their recommendations[12] are the following (paraphrased except for material in quotation marks below):

1. High school graduation should become universal for all youth.

2. Although most vocational training should be deferred until after high school, "there are some pupils whose greatest potential can be realized through occupational-vocational-technical education."[13]

3. Free public education for two years beyond high school should be made available on a nationwide basis, the key institutions being community colleges and technical institutes. Strong programs of trade, technical, and business education should be offered by these institutions.

4. Access to university and professional education should be made financially possible for all qualified students. "The university is an

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4. Access to university and professional education should be made financially possible for all qualified students. "The university is an

institution of strategic importance to technological advancement, both as an educational and as a research institution."[14]

5. Education, training, and retraining in a coordinated system of public education including the common schools, community colleges, vocational-technical schools, universities, and in-plant training programs should be available to individuals throughout their lives.

Unanimity on all the issues appraised in the commission's report was not to be expected, and it should be noted that there were some "minority reports" submitted. As might be expected the major cleavages were along management-labor lines. Illustrative of such disagreements are the following excerpts from "minority group" comments on the pace of technological change. Two representatives of management had this to say:

> Automation represents a logical extension of this 200-year-long history of technological progress that carries the potential for continuing to enhance the productive capabilities of our society and to make possible the continuing expansion of the material, social and spiritual welfare of the nation and the world. It does not represent a radical departure from past experience, but its continued development is essential to expand the capabilities of our society and to disseminate more widely rising levels of human well-being.[15] (Emphasis added.)

On the other hand, a group of labor representatives, joined by a representative of the Urban League and a representative of a nonprofit foundation, expressed the fear that technology has a number of dangers, and that there is not a sufficient sense of urgency in dealing with them. Some of their comments follow:

> We feel obligated to state that--the report lacks the tone of urgency which we believe its subject matter requires and its recommendations reflect.
>
> We agree that the problems flowing from technological change during the next decade will not be unsolvable economically. The obstacles to their solution are essentially political. The fundamental political problem is a lack of a sense of urgency in many quarters in dealing with human problems....[16] (Emphasis added.)

In summary, vis-a-vis technological change, automation, and "cybernation," it must be honestly admitted that the future is not clear. We will be faced with dramatic, perhaps even cataclysmic changes in the years stretching ahead to A.D. 2000. But when in the history of man has he not had to face change? Have economies ever been without disjunctions or societies without dislocations? Will the youth who joins the labor force tomorrow and retires in the year 2000 really face more fearsome changes in his work or greater challenges to his sanity than did today's "senior citizen" who drew his first check in 1920 and retired yesterday? The futurists, the alarmists, the "dangerous iceberg" group all would reply in the affirmative, and would probably also suggest that technical-vocational education for the jobs of the future is a waste of time. In a curious exercise in intellectual acrobatics, these persons generally seem to be saying that to prepare for the immediate, dynamic, "cybernated" future, we should pattern our education after the remote, static, and pastoral past.

Most economists, many scientists and engineers, the large majority of businessmen and industrialists, and many serious students of manpower policies would tend to agree that the changes ahead will indeed be dramatic and accelerated but not disastrous. They would postulate that as productivity goes up, demand will go up; that as fewer persons are needed to produce goods, more persons will be needed to produce services. They would interpret the events of the past century to indicate that competition and the market economy do produce higher levels of material and societal well-being, and that education, far from concerning itself solely with the liberal arts, must be from the very earliest school years through life-long re-education and retraining a well-conceived balance between the "common learnings" and the practical skills and knowledges needed to be a productive member of the economy. These persons would insist that work as an ethic is not dead, that it has significant value in the psychological and emotional realms as well as in the material realm, and that an individual's membership in a society, clearly implies his contributing to that society. And, in conclusion, they would probably agree that education has perhaps the most vital of all roles in the coming decades. They would probably concur in the general conclusion of the President's commission referred to above, that most occupational education should take place at post-high school levels, and that post-high school educational institutions (including colleges and universities) must increasingly become centers for professional, technical, and occupational education rather than remaining islands of tradition in a sea of change.

Technical and vocational education will probably be with us for a long time. The need for specific skills which can be learned in formal programs of occupational education is likely to intensify rather than to diminish. The day when theory-oriented education will accomplish all the practical tasks of society is far, far in the future, if indeed it will ever arrive. Consequently, let us take rather lightly the proposals to discontinue vocational education, but take very seriously the proposals to improve it. A first step in improving it relates to the changing nature of jobs and to the kind and level of education and training necessary to produce well-qualified persons for the present and future labor force. Manpower research cannot predict the future with certainty, of course, but extrapolation of long-term and recent trends, within a framework of reasonable assumptions, can help establish guidelines for planning. It is to a consideration of these trends that we now turn.

The Manpower "Mix" for the 1970's

Changing manpower needs in the United States have been the subject of much inquiry in recent years. The Bureau of Labor Statistics, United States Department of Labor, has carried out a number of well-designed studies on manpower projections. Employment shifts from 1940 through 1960 and projected to 1975, as compiled from recent BLS studies, are shown in the following table.

Distribution of the Labor Force by Major Occupational Group
(United States, 1940 to 1975)[17]

Major Occupational Group	Percentage of total U.S. Labor Force 1940	1960	1975
Professional, technical, and kindred workers	7.5	11.6	14.2
Managers, officials, and proprietors, except farm	9.6	10.6	10.7
Clerical, sales, and kindred workers	18.6	21.3	22.9
Craftsmen, foremen, and kindred workers	11.6	12.8	12.8
Semiskilled, operatives, and kindred workers	21.7	18.0	16.3
Service workers	10.5	12.5	14.3
Unskilled workers (laborers), except farm and mine	6.4	5.5	4.3
Farmers, farm managers, farm laborers	13.8	8.1	4.5

Note: Percentage columns may not add to 100 due to rounding.

Even a cursory examination of these data yields a number of conclusions for educational planners, among which the following would seem paramount:

1. Since jobs for unskilled workers will be such a small factor in the 1975 labor force, the common school (K-12) must prepare all youth either (1) for a job requiring a significant level of competence and skill or (2) for further study at post-high school levels. The post-high school study might be in regular academic college work or in a one- or two-year occupational education program.

2. The semiskilled and operative level jobs are also decreasing in relative importance, indicating that realistic job preparation will usually involve either post-high school formal education, or apprentice training, or similar on-the-job education and training.

3. Service jobs are on the increase, and schools should emphasize training programs for these jobs. The guidance function in schools will need to emphasize the giving of occupational information about and improving the image of the service occupations.[18]

4. Employment in the distribution sector of the economy (office occupations, sales, and kindred) will take an increasingly larger percentage of the labor force. About one of every four workers will be employed in this occupational group by 1975. True, offices are being automated, but so far at least the number of workers needed increases

each year. The nature of the task performed is changing and educational programs will need to reflect these changes.[19]

5. The greatest percentage gain of all is in the group of occupations requiring the highest level of education and training. This group (professional, technical and kindred) will grow by nearly 40 percent between 1960 and 1975. Nearly all these workers will require two or more years of college-level (including community colleges and technical institutes) education and training.[20]

The writer, in a publication based on a two-year research project for the American Association of Junior Colleges,[21] has suggested that in order to bring about a better fit between the nation's educational structure and its occupational structure, a four-level educational system is needed instead of the present three-level structure. The traditional pattern--elementary school, secondary school, college--is still the accepted format in American education, with the dream of universal education through high school becoming nearly a reality in most states 50 years after it was first envisioned.[22] But serious discontinuities are increasingly evident in the education-vs.-work matrix which falls between high school graduation (preparation for skilled and semiskilled jobs) and college graduation (leading to professional and top-level managerial jobs). In between these occupational categories are hundreds of thousands of semiprofessional and technical jobs in industry, business, health and medicine, research, public service, agriculture, and education, which are "middle-level" in the sense that they fall somewhere between what a high school graduate is capable of doing or becoming and what a college graduate (baccalaureate degree) is satisfied to do. Put another way, there is now a clearly identified and quite large segment of the labor force for which high school preparation is insufficient and a (four-year) college degree is unnecessary. By the same token there are hundreds of thousands of high school graduates whose levels of interest in and innate capability for further education are such that post-high school study is definitely indicated, but a (four-year) college is not indicated.

I should emphasize that economic competence (i.e., job performance) is not the sole aim of post-high school occupational education. The typical two-year associate degree curriculum, for example, has at least one-fourth of its total content in general education--the common learnings for citizenship. Another one-fourth of the work is in basic theoretical courses in the sciences, mathematics, engineering, or similar fields, thus tending to minimize the dangers of specialized skill obsolescence in the future. The "cluster" or "field-oriented"[23] approach to curriculum development is favored by most two-year colleges in their associate degree programs.

If there is acceptance for the rationale of the past several paragraphs, the conclusion is readily reached that a fourth level of education must take its rightful place in the American system. The two-year college, by whatever name (junior college, technical institute, community college), is already recognized in many states as a fourth and equal partner in the educational corporation. In certain other states full recognition is yet to come, and in a very few states the conditions of three decades ago still prevail.

A highly industrialized society, one with a "technological revolution" underway, must have a work force without serious discontinuities. Scientists, engineers, planners, "think men," governmental leaders, and professionals in almost every field are discovering that their effectiveness can be significantly improved, perhaps multiplied several fold, by the contributions of semiprofessional technicians and highly skilled workers in the middle manpower segment of the occupational spectrum. In their classic study of human resource development among the nations of the world, Harbison and Myers emphasize the importance of technical education in advanced industrial countries. They state:

> With universal primary education achieved, major attention can be focused on qualitative improvements in secondary education and the expansion of higher education through junior colleges, technical institutes, and universities. And because of the dynamic changes continually taking place in the occupational structure of the advanced countries, adult

> education, and mid-career training and retraining become essential instruments for providing flexibility in the labor force.[24]

Harbison and Myers also develop the thesis that the two major problems of human resource development in underdeveloped nations are (1) a shortage of high-level manpower with critical skills and competencies, and (2) an underutilization of manpower. Their definition of high-level manpower includes the following occupational categories: (1) administrative, managerial and entrepreneurial personnel; (2) professional personnel, such as scientists, engineers, physicians, educators, lawyers, architects, agronomists, etc.; (3) subprofessional technical personnel, such as technicians, nurses, senior clerks, the highest level of skilled craftsmen, and high-level secretaries and sales workers; (4) top-ranking political leaders, labor leaders, law enforcement and military officers.

One easily identifiable weakness in the economic development of many "emerging" countries is the almost complete absence of the subprofessional technical group and the failure to provide any educational programs for the training of such personnel. Typical of such nations is an educational system with (perhaps) universal primary education, followed by a quite limited opportunity for secondary school education (the curriculum of which is designed almost solely to prepare for the university), capped off with a college and university system designed to produce professional personnel and "philosopher kings," and with admissions standards at such a level that only 3 to perhaps 5 percent of youth can even "make it" to college. Such nations will probably remain "underdeveloped" no matter how much foreign aid in the form of money capital they receive. In the words of Paul G. Hoffman, managing director of the United Nations Special Fund, these "underdeveloped countries need high-level manpower just as urgently as they need capital. Indeed, unless these countries are able to develop the required strategic human resources, they cannot effectively absorb capital."[25] (Emphasis added.)

We come then to the realization after a thousand years that "higher education" is after all not a cult for the few, but a necessity for the many--that it is the driving force behind the economic and cultural development of nations. The Aristotelian concept of education only for the leisure class is as barren today as the very idea of a leisured class. In our society, rich and poor alike work, tycoons of industry and members of the professions in many instances setting themselves a far more demanding pace than the production quota in the factory sets for the assembly line worker. In our society, education may in part be preparation for leisured moments and for interludes of contemplation, but it is also preparation for work. Indeed, the only sure guarantee of leisure in our time is a lack of education. If there is a leisure class in America today it is youth in an affluent society, freed from the farm chores and the odd jobs of a former era, and as yet lacking in the knowledges and skills required to obtain and hold down a "regular" job. In our society, and certainly the same is true of other advanced industrial societies, education and work share more and more common elements with each passing year. Grant Venn, in his recent year-long study for the American Council on Education, puts it this way:

> It is the thesis of this report that technology has created a new relationship between man, his education, and his work in which education is placed squarely between man and his work. (Emphasis added.) Although this relationship has traditionally held for some men and some work (on the professional level for example), modern technology has advanced to the point where the relationship may now be said to exist for all men and for all work.[26]

Adler and Mayer pose the question with clarity and terseness as they lead the "modernist" to ask: "How can the 'traditionalist' say, on the one hand, that human society has been revolutionized by democracy, industry and science and, on the other, that the education appropriate to pre-industrial aristocracy or feudalism is appropriate today?"[27]

Pursuing the same theme these authors quote John Dewey's concept of a liberal education: "A truly liberal and liberating education would refuse today to isolate vocational training on any of its levels from a continuous education in the social, moral and scientific context within which wisely administered callings and professions must function."[28] And again, Brubacher, in the same vein, states:

> When only the few were free, they did no work; consequently there grew up the tradition exalting general or liberal education and denigrating special or vocational education. Clearly such an educational tradition became incongruous in a democratic society where all men are free and all work. . . . modern liberal education must find a worthy place for work in its curriculum, not grudgingly, nor of necessity, but willingly and enthusiastically.[29]

American higher education must do some soul-searching and some redefining of terms. Higher education for leisured man is hardly a fitting role for that vast enterprise on which America as a nation has wagered its future. The "liberal education" needed and demanded by college students today is that which will liberate them from ignorance and ineptitude, free them from dichotomous ideas about work and leisure, and prepare them for a life of productivity in a world where productivity will be the price of survival. This kind of education is vocational education in the real meaning of the term--preparation for vocation, for one's calling in life. If American higher education has no stake in this venture (some Aristotelians would have us believe this, and some colleges are dominated by them), then it is not deserving of the esteem in which it is held, nor of the treasure which annually comes to its coffers from the American people.

II. VOCATIONAL-TECHNICAL EDUCATION IN COLLEGES--A STATUS REPORT

A sizable though decreasing share of vocational and technical education can be provided by the secondary schools through apprenticeship programs and through industry training programs. Increasingly, however, as the cognitive content of jobs at all levels increases, vocational-technical education is a job for colleges and post-secondary technical institutes.

The High School and Vocational Education. Ever since the Smith-Hughes Act of 1917, American high schools have been to varying degrees, at different times and in different places, involved in vocational education. The four recognized areas were agriculture, business (i.e., distributive), homemaking, and trade and industrial. Legislation in ensuing decades provided Federal funds for a variety of other kinds of programs, including vocational nursing, technician education for industry, office occupations, and service occupations. The Vocational Education Act of 1963, in Sec. 8(1), defines "vocational education" very broadly as meaning:

> vocational or technical training or retraining which is given in schools or classes...as part of a program designed to fit individuals for gainful employment as semiskilled or skilled workers or technicians in recognized occupations.... Such term includes vocational guidance and counseling..., instruction related to the occupation, ...the training of persons ...preparing to become vocational education teachers...and the acquisition...of instructional supplies, teaching aids, and equipment....[30]

Most states and communities have placed secondary-level vocational education programs in the so-called comprehensive high school. In some cases, under quality leadership and in regions where good relationships could be developed with the business and industrial community, it would be fair to say that vocational education in the American high school has been a success. In other communities where these ingredients were lacking, it has been a resounding failure. Some regions and states have placed the blame for ineffective vocational education programs on the comprehensive high school idea itself, claiming that effective, job-oriented training cannot be carried on in these institutions. Certain states, cities, and regions have instead developed systems of vocational high schools with a single-purpose curriculum to develop practical skills and make their graduates employable.

There developed during the 1950's increasing dissatisfaction with secondary-level vocational education. Both the comprehensive high school and the vocational high school came in for severe criticism. The complaints centered on two themes:

1. So-called "comprehensive" high schools (it was claimed) put two-thirds of their effort on the one-third of the students who were college-bound. Vocational education was not given a real chance. It was understaffed, poorly equipped, held in low esteem, and in most cases was unrealistic in that it did not actually prepare young people for entry jobs.

2. Vocational high school programs were said to be too narrowly conceived, concentrating on skills with little attention to theory and cognitive activities, and with little emphasis on the common learnings. Students at vocational high schools were "second-class citizens" in "dead-end" training programs.

In counterpoint to these themes was the insistent voice throughout the late 1950's and early 1960's of unemployed youth. The secondary-school dropout problem was accentuated by the stepped-up vigor of high school programs following Sputnik I in 1957, and the foreboding phrase "out of school and out of work" was heard repeatedly in the early 1960's. A nationwide attack on the problem seemed essential, and in 1961 President Kennedy assembled a distinguished panel of consultants to study the whole problem of vocational education in the United States. This panel, chaired by Dr. Benjamin C. Willis of Chicago, submitted its report[31] to the Secretary of Health, Education and Welfare in November, 1962. The report effectively contended that a national emergency existed, and the

88th Congress was sufficiently convinced that it prepared and passed legislation which declared a vastly increased Federal interest in vocational education. The Vocational Education Act of 1963 (Public Law 88-210) was signed into law by President Johnson in December, 1963. It made available to the states greatly increased sums of money for vocational education purposes.

In the years since 1963 there has indeed been a considerable improvement, or at least expansion, of vocational education in high schools. Administrators, counselors, and even perhaps the rank and file of high school teachers have come to realize that the American high school is not just a prep school for colleges, that it has a number of other functions, including a responsibility to prepare some youth for direct entry into the labor force. More than a few former critics now would agree with the statement of James B. Conant, when he said in 1959:

> I do not see how anyone who has visited the kind of practical courses I visited could recommend eliminating vocational and practical work from the high school.
>
> When I hear adverse criticism of vocational education, I cannot help concluding that the critic just has not taken the trouble to find out what he is talking about.[32]

Despite the infusion of new money and new programs over the past four years, high school vocational education is still in trouble. Most of the issues and problems involved in secondary school vocational education are controversial, but many people would agree that the list below contains some of the major problems:

1. Money is more plentiful in recent years but good teachers are hard to find.

2. The proper balance between the "common learnings" and the "practical arts" is yet to be determined.

3. Most high schools are not large enough to be truly comprehensive.

4. Youth graduating from high school (at age 17 1/2 or 18) have difficulty finding jobs just because they lack maturity, despite the skills they may have attained.

5. Realistic vocational training (as distinguished from industrial arts) is nearly impossible in many high school settings.

6. The vocational department is still regarded by many teachers and counselors as a "dumping ground" for low ability students.

7. Students are reluctant to decide on a vocational objective at age 16 or 17. Peer pressures, and parental pressures in many instances, propel students into academic (college-prep) programs, even though they have no predilection whatever for academic scholarship.

8. The nature of most jobs in industry and business today is such that high school preparation is insufficient.

9. Related to the previous problems is the fact that many, if not

most, technical and semiprofessional jobs require a solid grounding in academic subjects (English, science, mathematics) at the high school level.

These issues are being confronted head-on by high school curriculum planners, but it must be admitted that incisive breakthroughs are not being made on many fronts.[33] "Area schools" are being initiated in some states, with several contiguous high schools pooling their resources to build a centrally located vocational-technical center where students can be transported for their vocational courses while retaining student body membership in their home high schools. The problems of adequate enrollment, quality of teaching staff, unit costs, and modern equipment can, it is thought, be solved by this approach.

Through the summer of 1966 the General Education Subcommittee of the House Education and Labor Committee held hearings on vocational education, focusing mainly on the Vocational Education Act of 1963. The hearings elicited a number of interesting statistics and identified many "trouble spots."[34] Among the statistics were:

1. Total Federal, state, and local funds in reimbursable technical-vocational education programs increased from $332 million in 1964 to $562 million in 1965.

2. From early 1965 through the 1966 fiscal year $29.2 million had been put into vocational education research projects. The USOE had

funded over 300 projects during the period.

3. Enrollment figures were criticized by an AFL-CIO spokesman. Most of the apparent gains in high school programs are the result of office occupations students now (since VEA 1963) being included in reimbursable vocational education statistics. Adult enrollment in job-upgrading programs is up encouragingly, but VEA '63 has not had a satisfactory impact on enrollment trends among youth of high school age.

"Trouble spots" were identified by an A. and M. university president and former official of the USOE as follows: (1) the continuing teacher shortage; (2) limited occupational information; (3) archaic teaching methods; (4) lack of application of much of the funded research; (5) inflexible fiscal procedures, with Federal reimbursements frequently delayed as much as a year; (6) poor public relations; (7) shortage of leadership personnel; and (8) difficulties inherent in scheduling and in the "traditional school year."

There is serious and continuing inquiry into the role of the high school in vocational education. During the summer of 1965 the Massachusetts Institute of Technology sponsored a six-week summer study of vocational education. Curriculum planners, administrators, university professors, industrialists, sociologists, labor leaders, and manpower specialists all came together for an intensive look at vocational education--past, present, and foreseeable future. The report of the summer study[35] centered on the general theme of bringing vocational education into the mainstream of American education. Some of its major recommendations follow:

1. Introduction of new curriculums and instructional materials for all students at the start of junior high school. Use of experimental and investigative activity (rather than dependence on the written and spoken word) as a route to the acquisition of skills and knowledge.

2. Establishment of regional multi-purpose education centers where educational research, teacher education, instructional materials development, and curriculum development can be carried on.

3. Development of "roads back to formal education" from the apprenticeship programs of labor, industry, and government.

4. Building of better acceptance or "status" for occupational education programs.

The summer study at M.I.T. was especially concerned with that very large number of high school students which is neither enrolled in standard vocational courses (only about 7 percent are so enrolled) nor is succeeding in a standard academic curriculum leading to four-year college entrance (only 20 percent of all students in U.S. high schools ever earn a bachelor's degree).

It seems increasingly clear to many students of the education-manpower scene that, although the high school will continue to have a terminal responsibility in vocational education for some youth, the major thrust of its total program of education should be to prepare students for further study. Writing in the Phi Delta Kappan, the author has expressed this thought as follows:

> high school vocational education will not be terminal at all, but will take the form of preparation for advanced post-high school occupational education. Just as the high school now prepares the academically superior student for college and university study leading to a baccalaureate degree in a "college prep" track, many high schools will soon have a "pre-technical" or "pre-occupational" track to prepare middle-level students (and they outnumber superior students two to one) for post-high school study leading to the associate degree and employment in "middle manpower jobs."[36]

Apprenticeship Programs. In theory one gets to be a skilled craftsman by serving a formal apprenticeship as an "indentured apprentice" for a stipulated period of time, by learning on the job from a master mechanic (journeyman), and by learning related technical information in formal classes offered in evening (adult) high schools or in union-organized schools. Every state has formal machinery for regulating apprenticeship programs, and ideally the manpower pool of skilled craftsmen should be undergoing continual replenishment from a flow of young men finishing out their period of apprenticeship.

This ideal is far from being attained, however. In all honesty it is probably correct to evaluate the apprenticeship system in the United States as a near failure. It is not even maintaining the present size of the skilled manpower pool, let alone expanding it at a rate commensurate with the overall growth of the labor force. What are the reasons? Kohler gives a few, as follows: "Apprentice training can begin at eighteen. But in practice most apprentices start much later. The average age is twenty-four. And the nepotism that prevails in unions precludes any significant number of youth from getting their training through apprenticeship. Here again most youthful workers are excluded!"[37]

By no means should all the blame be placed on union nepotism and union protectionism policies. Employers, too, like to hold down the number of apprentices, since they have to share in the cost of the training. It is frequently advantageous to both employers and journeymen to have journeymen work overtime, even at advanced rates of pay, rather than to add additional apprentices to the crew. Furthermore, youth themselves shy away from the idea of a long period of relatively low-paid, "indentured" work experience. There is perhaps more of the master-slave, boss-flunky relationship in indenture than there is of the teacher-student relationship.

But whatever the reasons, the facts are that formal apprenticeship programs are not making a major contribution to skilled manpower needs.

Projections for this decade made by the Bureau of Labor Statistics show a need of 520,000 new skilled craftsmen (journeymen) annually through 1970. In 1960 only 60,000 new journeymen were added through all apprentice programs. Recent years have shown some improvement, but deficits of 200,000 to 300,000 journeymen per year seem certain for years to come.

In summary, then, the position developed here is that neither the high school nor the formal apprenticeship system, separately or combined, hold very much promise for meeting the needs of the nation for either skilled manpower or for semiprofessional and technical manpower. Education and training for the vast majority of the jobs of the future will be best carried out in formal educational programs rather than in union-dominated apprenticeship programs. Furthermore, the cognitive, skill, and maturity demands of today's and tomorrow's jobs are such that *post-high school education and training* is essential for nearly two-thirds of the labor force.

Let us turn now to a brief analysis of the occupations in the middle of the manpower spectrum.

The "Middle Manpower" Job Spectrum

As applied to post-high school technical-vocational education there is need for agreement on the meaning of certain terms and phrases.

Community colleges, technical institutes, and to some extent, technical-vocational schools, all make use of the following terms, and many (but not all) persons in these institutions would find acceptable the definitions listed here:

1. Occupational education is a generic term referring to any and all education and training programs designed to prepare persons for employment, as distinguished from curriculums and courses in the liberal arts, or the humanities.[38]

2. Semiprofessional education is composed of those formally organized curriculums and programs (usually of less than baccalaureate degree length) which lead to employment in career fields recognized as subprofessional, or semiprofessional in status. Some examples are architectural draftsman, business data programer, engineering technician, medical technician, accountant (less than C.P.A.), associate degree nurse, physics or mathematics aide, X-ray technician, etc.

3. Technical education is perhaps the most loosely used phrase in the literature of occupational education. To some, it seems to be synonymous with all of post-high school occupational education and to include programs in health, business, home economics, trade, and industrial education, and even tourism. Others at the opposite pole give the term a very restricted meaning and apply it rather strictly to engineering technology.

There is growing acceptance, however, for a definition[39] which says that technical education: (a) contains a basic core of work in applied science and/or mathematics and is frequently but not always related to industry and engineering; (b) is post-high school in level and usually is organized into two-year curriculums leading to the associate degree, ordinarily including at least 64 semester credit hours; (c) maintains a careful balance between cognitive content, on the one hand, and practice and skill in the use of instruments and tools, on the other; (d) leads to occupational competence at a semiprofessional or very highly skilled level; and (e) includes significant content in college-level general education courses (social studies, English, humanities, etc.) up to one-fourth of the total curriculum credit hours.

4. Trade and industrial education is a term used to describe pre-employment, i.e., vocational education programs in fields leading to eventual employment in the skilled trades or in jobs at semiskilled or operative levels.

5. Business education under the older Federal vocational education acts was separated for reimbursement purposes into distributive education, which was reimbursable, and office occupations education, which was not reimbursable. Since 1963, both distributive and office occupations programs are reimbursable and the single term business education is now used. It is worthy of note that some business occupations are technical level occupations, e.g., business data programer.[40]

6. Health occupations run the gamut from unskilled and semiskilled jobs, such as hospital orderlies, through practical nursing (skilled), associate degree nurse (technical), and baccalaureate degree nurse (professional).[41]

7. Agriculture education has experienced some decline in recent years. The Vo-Ag programs which were popular for decades in secondary schools are experiencing lower and lower enrollments, and indeed many high schools have phased them out in recent years, as the number of family farms has declined in some states. Agriculture technology and Agri-business programs have been on the increase, however, particularly in junior colleges, as a recognition of the impact of technology on American agriculture.

8. The service occupations represent a relatively new venture for two-year colleges. The emergence of associate degree programs in these fields constitutes recognition of the fact that the service occupations (including public service) as a group will involve a much higher percentage of the labor force in the future. Many of the service occupations are semiskilled, but some are skilled, and others are semiprofessional and even professional in level.

Families or Clusters of Jobs. An attempt is made in the following to list some of the families of jobs for which post-high school occupational education programs are presently operating and for which they are being planned. The list is merely illustrative, not complete.

1. Business-related occupations

Accounting--bookkeeping
Advertising layout
Business data processing
Business data programing
Buying--purchasing
Credit and collections
Insurance
Real estate
Salesmanship
Secretary--many options
Stenographer
Store management
Typist clerk

Most of these job fields are semiprofessional in nature, but some fall in the skilled-level category. Business data programing would be classified as a technology.

2. Health-related occupations

Certified (medical) laboratory assistant
Dental hygienist
Dental laboratory technician
Dental office assistant
Histologic technician
Hospital aide
Inhalation therapy technician
Medical laboratory technician
Medical office assistant
Mental health worker
Practical (vocational) nurse
Prosthetic technician
Psychiatric aide
Radioisotope technician
Registered nurse (A.D.N. or diploma)
X-ray technician

Most of these jobs are semiprofessional in level, and many are technical, in the sense that a strong base of science and/or mathematics is required. Some, however, are skilled-level jobs for which formal (i.e., in-school) training can be minimized in favor of increased on-the-job training.

3. Research-related occupations

Ballistics technician
Biological technician
Biophysical technician
Chemical technician
Geophysical technician
Hydrographic technician
Mathematics aide
Metallurgical technician
Meteorological technician
Oceanographic technician
Physics research technician
Spectroscopy technician

All of these occupational fields fall within the semiprofessional and technical spectrum as regards both job demands and educational programs.

4. Engineering-Industry related occupations

A. Related to mechanical occupations

- Aerospace technician
- Air conditioning/refrigeration technician
- Automotive mechanic
- Automotive technician
- Diesel mechanic
- Draftsman (several options)
- Foundry technician
- Heavy equipment mechanic
- Hydraulics technician
- Industrial technician
- Inspector
- Machine operator
- Machinist
- Materials test technician
- Operating "engineer"
- Plant foreman
- Plant maintenance mechanic
- Quality control technician
- Tool and die technician

B. Related to electrical/electronic occupations

- Aerospace technician
- Electric motor repairman
- Electrical power technician
- Electronic technician
  - Options: Communications, Computer, Industrial electronics, Radio, Television, Telephone, Microwave
- Hydroelectric plant operator
- Instrumentation technician
- Lineman (electric power)
- Missile technician
- Steam plant operator
- Telephone installer
- Wireman

C. Related to contract construction and civil engineering occupations

- Architectural draftsman
- Building construction supervisor
- Building construction technician
- Building inspector
- Building trades journeyman (several options)
- Concrete test technician
- Estimator
- Heavy equipment operator
- Materials test technician
- Sanitation technician
- Surveyor

D. Miscellaneous technical and skilled occupations in industry

- Ceramics technician
- Chemical technician
- Engineering technician
- Nuclear power technician
- Optical technician
- Petroleum technician
- Radioisotope technician
- Sales "engineering"
- Technical illustrator
- Technical writer

Many of the occupations listed under these headings (A, B, C, D) are clearly semiprofessional and/or technical; but many are also at the highly skilled level. Two years of college is almost mandatory for some, while others place more of a premium on skills than on cognitive content.

5. Public-Service and Personal-Service Occupations

Audiovisual technician
Baker
Barber
Cafeteria manager
Chef (cook)
Cleaning and pressing operator
Cosmetician
Dining room hostess
Environmental control technician
Fireman (fire department)
Fish and wildlife technician
Forestry technician
Hotel and restaurant occupations
Law enforcement occupations
Mosquito abatement technician
Motion picture operator
Nursery school operator
Regional planning technician
Sanitation technician
Security patrolman
Service station attendant
Social worker aide
Teacher aide
Tour guide
Waiter/waitress

These occupations run the gamut from the semiskilled level to skilled and on to semiprofessional and near-professional levels. Some require only a brief (six- to eight-week) post-high school training program, others an apprentice program, and still others two or more years of formal college work.

6. Agricultural Occupations

Agri-business jobs, n.e.c.
Agricultural research technician
Crop-duster (aviator)
Farm equipment repairman
Farm equipment salesman
Farm supplies salesman
Farmer (owner or manager)
Feed mill operator
Foods processing technician
Frozen food plant operator
Irrigation specialist
Landscape designer
Nursery operator
Soils technician

These jobs in agriculture have gained recognition in the past few decades as farming has undergone a radical change from the family-owned farm of the past to the "farming-as-a-business" philosophy which prevails today. Although jobs on farms are decreasing in numbers, jobs directly or indirectly related to agriculture production and processing are not decreasing. Specialized knowledge and skills, acquired either through post-high school education or through years of on-the-job training, are required for most of these jobs.

These, then, are representative occupations and job clusters within the middle manpower spectrum. They have several features in common:

1. In general, they have evolved from the impact of technology on the economy and on society.

2. They range from the semiskilled level through a continuous spectrum to the semiprofessional or near-professional levels. In almost all cases, the job demands are partly cognitive, partly manipulative.

3. Typically (though not entirely) they require formal education beyond the high school, but not to the level of a four-year college degree. In many of the occupations, on-the-job training, apprenticeship, or continuing (part-time) education can substitute for full-time college attendance.

4. Most of the occupations are what are commonly called "white-collar" jobs. Some, however, are in the "blue-collar" category, and

still others are of the "sport-collar" and "smock" variety.

5. Their designation as middle-level jobs stems from the frequently encountered relationship of these workers to the professionals at one end of the occupational spectrum, and the tradesmen, craftsmen, operators, and unskilled workers at the other.

By 1975 it is quite probable that these jobs will account for at least one-third of the labor force of the nation. Granted that formal college (or other post-high school) study is not essential for all these jobs, it is essential for most of them. Industry training programs can help; government-sponsored training programs like MDTA and the Youth Corps program can help; and military technical training can help; but the big burden for the proper preparation of this large segment of the work force of the 1970's will have to be carried by community junior colleges, technical institutes, certain four-year colleges, business colleges, and other post-high school institutions within the formal educational establishment.

In a very real sense these are the occupations of the future. Economic viability will depend on them and so will the satisfaction of society's needs. Preparation for these jobs is increasingly a responsibility of higher education in America. The ludicrous posture of an ostrichlike higher education establishment with its tail feathers high and its head in the sand, wishing that these educational needs of the nation would go away so that peaceful academic browsing might be resumed, is one which is less and less likely to amuse Americans in the future. The plumes are apt to be unceremoniously plucked by an irate public demanding that higher education strut out in step with the 20th century.

Let us now turn to a discussion of those types of colleges and institutions which are, and will increasingly be, involved in postsecondary technical-vocational education.

The Colleges and Schools

Community (Junior) Colleges. The junior college movement has been characterized as the only really American innovation in higher education. From inauspicious beginnings in the early years of this century, the growth of the junior college movement has exceeded the wildest projections of its early protagonists. From a handful of institutions in 1910 concentrating on lower-division academic work, the movement has grown in less than 50 years to a gigantic undertaking, comprising in 1966 over 500 public institutions and 268 independent and church-related institutions.[42] Public two-year colleges enrolled in excess of 1,160,000 students in 1966, and the private institutions accounted for another 130,000 students. Fifty new junior colleges opened their doors to students for the first time during the 1965-66 college term. For the past five-year period the increase in enrollment has averaged about 10 percent each year. Some public community colleges are very large, with a few urban institutions enrolling nearly 20,000 students apiece. Others are located in sparsely populated regions and may have student bodies of fewer than 200 students. Large or small, their common purpose is to bring post-high school education to persons who might otherwise not have such an opportunity.

Junior (or community) colleges[43] which are publicly controlled are apt to offer a wider range of programs and courses than do the private two-year colleges. In the past two decades technical-vocational education has become a significantly important role of most public two-year colleges. Privately controlled junior colleges, on the other hand, tend to exhibit a greater singleness of purpose, usually being oriented toward liberal arts and academic studies, Christian education, or highly specialized occupational education depending on the constituency in control of the institution.

Public community (junior) colleges have great diversity as regards size and type, as regards kinds and levels of programs, and as regards abilities and aspirations of students. There is, however, an increasing measure of agreement among administrators and faculty of these institutions on five major purposes to be served by the public junior college. These are:

1. Occupational education. To provide programs of less-than-baccalaureate level in as many occupational fields as national, regional,

and local needs would indicate. Programs may be of two or even three years, leading to an associate degree; or they may be of one year or less, leading to a certificate of some kind, or simply to increased job competence.

2. College-parallel education. To provide lower division, college-parallel programs made up of courses in liberal arts and pre-professional fields. These courses are held at a level of quality which enables the student who completes the lower-division program successfully to "transfer" to a four-year college or university and continue on to the baccalaureate degree.

3. Student personnel services. To provide a carefully organized program of student personnel services, featuring career counselling, testing, educational advisement, course and curriculum selection, and placement services.

4. General and continuing education. To provide programs of general education--the "common learnings"--for all students regardless of career objective, and to provide a broad program of continuing education for adults of the community.

5. Community service. To serve as a center for a wide range of activities related to community betterment, concentrating on the educational, economic, and cultural development of the community.

Although there have been tremendous strides made in recent years with regard to the occupational education function in community junior colleges, it still must be admitted that some two-year colleges take on the occupational education role reluctantly. Boards of trustees, citizens generally, and many junior college administrators are ready to accord occupational education equal, or nearly equal, status with college-parallel education. Faculty members, however, constitute a strong traditional block on many campuses, which resists the introduction of significant programs of technical-vocational education. Some typical attitudes of tradition-bound faculty groups are paraphrased herewith from actual statements, verbal and published: 1. "We don't have enough money, facilities, and time for the 'good student' let alone those that aren't college caliber." 2. "If we must have some vocational education for the 'poor students,' locate these courses and shops off campus somewhere." 3. "Now that we are flooded with well-qualified applicants, let's raise the entrance standards and keep the 'riff-raff' out." 4. "Some of the semiprofessional programs are O.K. (i.e., business, nursing, engineering technology), but courses like welding, auto mechanics, and cosmetology don't belong in a college." 5. "If things keep going this way, pretty soon we'll be regarded as nothing but a vocational school."

Despite these traditional faculty attitudes, and other obstacles such as shortages of capital funds and reluctance of students themselves to enroll in technical-vocational courses, there has been a significant and steady growth in programs, courses, and enrollments over the past 10 years in two-year college occupational-educational programs. The most recent nationwide survey,[44] though now sadly outdated, found (in 1961-62) 879 institutions offering programs of at least one year but less than four years in length. The 1962 fall enrollment in technical and semiprofessional programs was 274,725 students. Recent nationwide data are not available, but it is quite probable that the 1966 fall enrollment figure would be at least 25 percent more than the 1962 figure cited.

The major instructional fields. For convenience, junior college occupational education programs can be grouped into several common categories. These, with some discussion of each, follow in ensuing paragraphs.

Technicians related to science, engineering, and industry. It is no accident that junior colleges have moved rapidly into this curriculum area. Demand for graduates has been steady, salaries paid to technicians are well into the semiprofessional range, a certain amount of glamour has been attached to both the occupations and the educational programs, and the field has been accorded the accolade of respectability by the engineering profession and by scientists and professional researchers. Despite the contributions of community junior colleges and technical institutes, however, there still exists a "technician gap," a net difference between demand and supply, of some 35,000 persons annually, according to a National Science Foundation estimate of a few years ago.[45]

Business occupations. Business education curriculums, in the aggregate, enroll more students in junior colleges than any other occupational field. Despite increasing automation in the business office,[46] the demand for well-trained secretaries, stenographers, and other office workers has not slacked off. Indeed it has intensified in recent years. Bookkeeping in the traditional sense is a declining field, but machine accounting, data processing, and business systems development are all on the upswing. Business management as a field for two-year college graduates is also an expanding field, including such job areas as advertising and sales, credit and collections, store management, and inventory control. No trustworthy research reports are available with regard to a "business occupations gap," but careful estimates by the author based on reports from junior college placement officials in Michigan, California, New York, and Florida indicate that the gap may be a very sizable one--on the order of 15,000 to 20,000 semiprofessional and highly skilled job openings nationally in 1966 for which qualified graduates are not available.

Health-related occupations. For the past year or two, community junior colleges have been giving increased attention to the education and training of persons to whom the generic term "health technicians" might be applied. Although the doctor and the nurse have traditionally been the key members of the health team, and their importance is, of course, still paramount, there is today a rapidly growing demand for semiprofessional support personnel to enable the professionals to extend their services to vastly increased numbers of the population. The Health Careers Guidebook[47] identifies over 200 job titles in the health field, and at least 40 of these are semiprofessional and technical in nature. The American Association of Junior Colleges has given recognition to the growing importance of the health occupations by publishing a recent and authoritative report on education for the health technologies.[48]

The public and private service industries. Jobs in the public service are continually changing just as are jobs in the private sector. Many fields of public employment once considered to be consistent with the abilities of the high school graduate are now gradually being upgraded to a point where one or two years of college are considered desirable or essential. Examples are law enforcement jobs, fire protection service (fireman) jobs, social worker aides, nursery school aides, conservation workers, environmental control (sanitation) technicians, parks and recreation workers, and wildlife management aides. In the very near future there may be an acceptance of two-year college graduates as teacher aides in the public schools, and most certainly there will be many new semiprofessional jobs such as audiovisual technicians, learning resources laboratory aides, and laboratory technicians for the multi-media learning "hardware" which is gaining a foothold in nearly every school system in the nation.

The service industries of the private sector of the economy are turning to the junior college also as they attempt to make their firms more competitive by the upgrading of personnel. Hotel and restaurant management, cooking and baking, service station management, laundry and dry-cleaning management, auto parts and service management, auto mechanic training, appliance service and repair, and barbering and cosmetology are just a few of the service industries jobs for which junior colleges are already giving education and skill training.

A Summary of the Potential of the Junior College

By no means does all post-high school technical-vocational education take place in junior colleges. Other types of institutions and training programs will be discussed in the ensuing pages. There is no doubt, however, that a major share of the task of meeting America's needs for middle manpower is the responsibility of the junior college.

Advocates of the community junior college would aver that for the great majority of youth today, post-high school education is a necessity. In another decade or two, the person with no more than a 12th grade education will, they feel, be considered educationally deprived. Many, perhaps more than half, of the youth who enroll in junior colleges will be there for a one- or two-year occupational education program whose content should consist of about equal parts of specialized skill training, supporting technical and theory courses, and a general education core.

Technical Schools

The Society for the Promotion of Engineering Education (now the American Society for Engineering Education) authorized in 1928 a study of technical institute education in the United States. William E. Wickenden and Robert H. Spahr conducted the two-year research project and their report[49] was issued in 1931. The opening paragraph of the report contained the following statement: "A need exists in our post-secondary scheme of education for a large number of technical schools giving a more intensive and practical training than that now provided by the engineering college."

Even then, it seems, engineering education left something to be desired as far as practicality was concerned. Thirty-five years have now elapsed since the Wickenden-Spahr report and it hardly needs to be said that engineering schools have moved even farther away from practicality. The prestigious engineering schools of today now emphasize engineering science and to some extent engineering administration. Research, design, and administration characterize the work of the engineer today, but operation, testing, and modification ordinarily do not. Engineering has moved toward the more extremely cognitive aspects of work, at the same point in time that the apprenticeship system seems to be weakening in its development of highly skilled craftsmen. A rather broad spectrum of highly skilled and semiprofessional occupations has developed which neither the science-oriented engineer nor the undertrained craftsman is really capable of handling. These jobs, or families of jobs, are known as the technician occupations, defined on an earlier page.

The term "technical institute" can be and is used to describe a type of education, as "technical institute type curriculum," and it is also used to describe a kind of school--that is, a school whose major purpose is the provision of education and training which prepares the graduate for successful work as a technician. Graney[50] lists five major attributes of technical institute education: 1. It is postsecondary. 2. It is essentially terminal. (But a goodly number of technical institute graduates eventually complete baccalaureate degree requirements.) 3. It is related to the fields of science and technology. 4. It offers intensive instruction in a specialized field for a relatively brief period. (Usually two academic years; occasionally one or three.) Content is characterized by depth in a narrow field rather than by breadth. 5. It lays heavy emphasis on application. The intent here is to familiarize the technician with enough of the elements of craftsmanship that he can effectively bridge the gap between the craftsman and the professional engineer.

The technical institute movement as a type of education has grown rapidly in the United States since the era of the Wickenden-Spahr study. But the number of institutions calling themselves "technical institutes" has not increased markedly. Wickenden and Spahr found in 1929 that only 31 schools in the United States were offering bona-fide programs of the technical institute type. By 1954 Smith and Lipsett[51] estimated that 69 schools were offering one or more technical institute type curriculums, and by 1957 a National Survey of Technical Institute Education, conducted by G. Ross Henninger[52] under the auspices of the Technical Institute Division of the American Society for Engineering Education, found that 144 schools were offering technical institute type curriculums. Of these 144 schools, however, it should be pointed out that many were public junior (community) colleges, some were universities operating a technical institute, and a few were schools operating in conjunction with a major corporation or an arm of the Federal Government.

The term "technical institute" can be and has been appropriated by most any school inclined to do so, but one standard of judgment which has some degree of acceptance is that of the Engineers' Council for Professional Development. This council maintains a list of schools which have one or more curriculums which meet their quite rigorous standards for technical institute type education. In 1958 only 36 schools in the nation qualified as "technical institutes" by ECPD standards in that they were operating one or more curriculums accredited by ECPD. Of these, two were public community colleges and six were branches or divisions of universities.[53] The number of such schools, though now greater than in 1958, has not increased markedly.

It should be emphasized that the standards established by ECPD for curriculums in engineering technology are intentionally quite high. It is the expressed intent of the ECPD and of the Technical Institute Council of the American Society for Engineering Education that ECPD-approved curriculums prepare their graduates for "that part of the engineering field which requires the application of scientific and engineering knowledge and methods combined with technical skills in support of engineering activities; it lies in the occupational area between the craftsman and the engineer at the end of the area closest to the engineer."[54] (Emphasis added.)

Many technical educators do not fully support the ECPD criteria, particularly as they relate to the requirements of calculus and engineering physics as basic courses in most programs. There is some justification, at least, for the belief that the ECPD standards are so high that only students of engineering caliber can succeed, and not a few technical educators pose the question, "Why make technicians out of potential engineers?" Others ask, "If technician jobs are middle-level jobs, why shouldn't technical education programs be pitched at a point where middle-level students can succeed?" Controversy on these matters continues unabated, as it does in many facets of technical-vocational education.

At the other extreme are programs and schools which are "technical" in name only. The terms "technician," "technology," and "technical education" have become very popular in recent years and a patina of respectability has accumulated around them. Consequently we find many trade schools, vocational high schools, industrial training schools, and some correspondence study schools making use of the term "technical institute" or "technology" in describing their school and its programs. A "trade school" can, it seems, become a "technical institute" overnight merely by issuing a new catalog.

The technical occupations (as related to science, engineering, and industry) represent a band from the total spectrum of science-engineering-industry occupations. At one end of the band the semiprofessional technician (or engineering technician, or science research technician) is working in close association with his professional colleague on work which is probably more cognitive than manipulative and for which a background of preparation similar to (but not necessarily exactly that of) the ECPD recommendations would be desired. At the other end of the band are persons sometimes referred to as "highly skilled technicians" or "industrial technicians," working at jobs whose content is more manipulative than cognitive, doing more repetitive kinds of tasks which, though some relationship to engineering is involved, are actually closer to the work of the skilled craftsman than they are to the work of the professional engineer or scientist.[55] At the one extreme the semiprofessional technician's work may actually overlap the work of the professional; and at the other, it is often difficult to distinguish between the work of the highly skilled technician and that of the skilled craftsman. In between the two extremes is a continuum of jobs whose "level" might arbitrarily be designated along some scale represented by a ratio of cognitive-to-manipulative activity.

The digression of the past several paragraphs has been included in an attempt to place the technical institute in its proper perspective with respect to other schools involved in vocational and technical education. Of all the kinds of institutions which include the term "technical" in their name or the term "technology" as descriptive of their curriculums and courses, we can arbitrarily (and with no value judgments ascribed, intended, or implied) group them into three general categories:

1. Technical institutes emphasizing programs in engineering technology. This group would include those institutions with ECPD-accredited curriculums, plus a goodly number of other institutions without ECPD-accredited curriculums, represented by a significant number of community colleges, by certain university extension centers, and by some private, nonprofit, some proprietary, and a few business or industry-operated institutions. "Graduation" from these institutions

and their programs usually implies the awarding of the associate degree.

2. Technical schools (or technical divisions of schools) emphasizing programs for technicians in the middle of the technician spectrum. This group would include perhaps 250 institutions in the United States. Included would be many (perhaps 200) community junior colleges, plus a significant number of private-nonprofit and proprietary institutions, and a few post-high school technical schools operated by public school systems.

3. "Technical schools" (or "technical divisions" of schools) emphasizing programs at the "trade-technical" or trade-and-industrial level. The number of such schools is rather difficult to estimate at present, since many new area vocational-technical schools are coming into being in some states at the current writing. Recent Federal legislation, including the Vocational Education Act of 1963, the Manpower Development and Training Act, and the Economic Opportunity Act, has spurred the development of this level of "technical school." In the interest of educational integrity, if the term "technical education" is to have any real meaning in the United States, it would be desirable to use the term "trade" or "vocational" rather than the term "technical" in describing the curriculums and courses of these schools.

Summary. It must be clear from the foregoing that no clear picture of "the technical institute" emerges in America at the present time. Both

Henninger and Graney[56] emphasize the term "technical institute type education," and they rightly attempt to define the characteristics of this kind and level of education rather than attempting to define "the technical institute" as a unique institution. We have seen that technical institute type education is offered in a variety of schools--in those actually calling themselves "technical institutes," as well as in university extension centers, community junior colleges, schools operated by industrial corporations, and in a few postsecondary schools operated by public school systems.

In concluding this section it is worthy of note that despite the large number of institutions involved, the "technician gap" still persists. The NSF study cited earlier projects an annual need (1966-70) of 70,000 new technicians per year (engineering- and industry-related fields only) to fill new jobs and take care of attrition due to deaths, retirement, and job shifting. The best estimates available (and there are no accurate figures, since there is no definite answer to the question, "What is a technician?") indicates that there is an annual development (1965-66) of about 40,000 technicians from all the kinds of technical schools and junior colleges discussed in the foregoing pages. There is, therefore, much room for growth, both as regards new institutions and increased enrollments in existing institutions.[57]

III. EDUCATIONAL ACTIVITIES OF OTHER AGENCIES

Business and Industry. The "basic educationists," whose philosophy of education was reviewed in an earlier section, would in general hold the view that the job of the school is to educate (in academic subjects), and that preparation for a job should be the responsibility of employers. Several reasons are cited for this position, among them these: (1) jobs change so fast that training given today will be obsolete tomorrow; (2) the required equipment is too expensive to provide for school purposes, and it too becomes obsolete in a very few years; (3) much of what goes on in business and industry is so highly specialized it cannot be properly taught anywhere except on the job; (4) most employers prefer to train their own skilled and technical workers anyway; and (5) teachers with the proper level of specialized skill cannot be found to staff occupational education programs; and so on.

There is some truth in all these statements, of course, and their aggregate effect is enough to discourage many colleges from offering specialized occupational programs. If all of them were true, it would be expected that industry and business would have gargantuan educational enterprises functioning with all the efficiency normally associated with business and corporate enterprise. If one's definition of occupational education is flexible enough, a case can indeed be made for a rather significant effort by private industry. Clark and Sloan,[58] after a detailed study in 1958, expressed the opinion that the total educational effort of business and industry would probably exceed that of all U.S. colleges and universities combined. Other studies, however, do not corroborate this finding.

The author, in a 1962 study of the feasibility of founding a community college in southeastern Michigan,[59] found that only the larger firms in that area operated any formally organized education and training programs. Of a sample of 207 firms, only 13 (6.3 percent) indicated that they had "an organized, operating training department, which conducts formal classroom training for employees." "On-the-job training" in which the new employee learns a specific skill by observing a worker more skilled than himself was reported by many firms, but this is not an educational activity in the sense being discussed here.

The American Council on Education sponsored a study in 1960 on the extent to which business and industry were involved in education. The report[60] emphasized that organized education programs in industry were geared largely to managerial and professional employees. Of 300 large firms investigated (those with more than 10,000 employees), only 8 percent made company-sponsored education programs available to hourly (i.e., technical, clerical, skilled and semiskilled) employees. The comparable figure for small firms was 6 percent. Serbein's study also covered educational programs in which business and industrial firms participated financially by paying tuition, fees, etc., for educational programs taken at nearby schools and colleges. Only about half of the companies surveyed indicated that all levels of employees were eligible for company participation in these courses.

Dauwalder[61] reported in a 1962 study made in Southern California that industry participation in educational programs leaves much to be desired. Of 837 middle- to large-sized companies (those with 500 or more employees) surveyed, only 17 had formally organized in-class kinds of education programs at technical or skilled levels. In contrast, many companies reported "executive development" or management training programs. There was ready agreement among the respondents that many more technical- and skilled-level employees were needed, but that business and industry were looking to the schools to train them. Only 5.3 percent of 364 companies surveyed were found to have organized on-the-job training programs. Only 2.1 percent had formal, planned programs for the further education and training of technicians and skilled craftsmen.[62]

Private industry, by and large, is not in the education business. It seems quite clear that, if the nation expects employers to educate and train their own employees, we shall have a sorry manpower situation indeed. And why should we expect this anyway? Why should society provide tax-supported schools and colleges to offer education and training for the future professional--the lawyer, the minister, the philosopher, the critic--and then say to the future technician, craftsman, or clerical worker, "Sorry, but you'll have to get your employer to train you." This is the old dichotomy resurrected once more to haunt us with apparitions from the past. The voices of tradition speak again, saying "Education for leisured man and for the professions is a just charge on the public purse; but education and training for work should be paid for either by the worker himself or by his employer." This mold-encrusted legacy from the Middle Ages is one we can do without.

What is needed is a new partnership between industry and the schools, and specifically between industry and the two-year colleges. Such a partnership could promote work-study programs, summer employment, more meaningful occupational curriculums, more effective guidance and placement programs, and utilization of qualified persons from industry as teachers. An excellent example of a formalized industry-education organization is the Southern California Industry Educational Council. SCIEC, according to a recent release from the American Association of Junior Colleges,[63] is "a nonprofit corporation organized in the belief that education is a total community responsibility. The Council encourages civic, business, professional, and industrial leaders to offer their unique resources for the enrichment of education in their communities." The council is further described in the A.A.J.C. Bulletin, as follows:

> SCIEC Serves the Schools:
> --Brings the resources of business, industries, and the professions to the schools;
> --Aids schools in understanding changing occupational requirements;
> --Motivates student commitment to educational excellence;
> --Finds ways of recognizing and encouraging better teachers;
> --Provides liaison service between the schools and SCIEC member organizations.
>
> SCIEC Serves Business and Industry:
> --Advises businesses, industries, and professional societies as to those areas of the educational program which can best utilize their resources;
> --Provides opportunities for community and educational leaders to meet face to face;
> --Advises the policy making groups in education of specific occupational requirements of businesses and industries;
> --Broadens the area of business and industry participation beyond their local community;
> --Coordinates requests for support of educational projects.

We have seen in an earlier section that apprenticeship, as a mechanism for training skilled tradesmen, is totally inadequate to serve the nation's need, and that one reason for its failure (besides union intransigence) is the reluctance of employers to give it their enthusiastic support. After the evidence is in, we are left with the realization that, although business and industry most certainly do contribute to the total task of education and manpower development, the contribution, in terms of formally organized educational programs, is not a large one. And, what is most important, only those persons already employed receive industry-sponsored education at all! The task of pre-employment education and training is almost entirely that of schools and colleges.

Military Training Programs. The military services operate a significant number of very good schools which give training to thousands of men (and some women) annually.[64] A considerable amount of basic education in communications skills and mathematics is included in some military training programs, and clerical skills are developed for thousands of persons during their stay in uniform.[65] Trade and technical skills are learned by large numbers of servicemen in such fields as electricity, electronics, communications, engine repair and maintenance, hydraulics, refrigeration and air conditioning, aviation, and in many of the building trades. Hospital corpsmen, pharmacist's mates, military police, storekeepers, mess stewards, and cooks all learn skills with varying degrees of carry-over into civilian life. Venn[66] estimates that some 10,000 technicians per year enter the labor force with a technical training background from armed services schools and experience. The salient fact remains, however, that most military training is for military purposes and we cannot assign a really significant educational role (for civilian pursuits) to the armed services. The thousands of persons who revert to civilian life annually with an employment capability constitute a plus value to the economy, but again the total educational impact is relatively small. Most servicemen need further education or even complete retraining as they make the transition from uniform to mufti. The extreme popularity of the World War II and Korean War G.I. bills are all the evidence needed to support this thesis. And, looking to the future, the new (1966) G.I. Bill will bring literally scores of thousands of veterans into post-high school institutions for technical-vocational education.

IV. CURRENT AND RECURRING PROBLEMS

The several states are making increased financial commitments to post-high school education. Local tax efforts tend to increase each year, and the current high level of family income permits most families to pay the relatively low tuition charges assessed by most junior colleges and technical schools. Federal funds, too, are now making some contribution to post-high school occupational education. There remains, however, a number of very serious problems which militate against a full flowering of the kinds of education and training which are the subject of this paper. We turn now to a discussion of some of these.

Status Problems. Just as job status is a factor in an individual's self-perception (for example, "white-collar" jobs are more attractive than "blue-collar" jobs, even though net income might be less), so is status a factor in the choice of an educational program. A student's peers, his family, his high school counselors and teachers, and his adult friends more often than not create pressures, overt or subtle, which lead him to choose an academic or liberal arts or pre-professional program of studies regardless of his real interest and demonstrated aptitudes. Business and industrial leaders, too, especially representatives of top management, are often a party to leading youngsters down the primrose path to failure in an academic program. Corporation presidents are frequently quoted as extolling the virtues of "a solid background in the liberal arts" (or science, or mathematics, or foreign language) for success in corporate life. These "squab-and-wild-rice" utterances by the top brass may occur simultaneously with the placement of Sunday newspaper "Help Wanted" advertisements by the same company in which the services of scores of technicians, secretaries, machinists, draftsmen, and assembly-line workers are solicited.

Furthermore, industry and business generally have not as yet accorded a recognized niche in the company pecking order to semiprofessional and technical workers. By and large, employers still think in terms of professional-level jobs (college graduates), skilled and clerical jobs (high school graduates), and semiskilled and unskilled jobs (no particular educational requirement). Some progress is being made in this matter by aggressive promotional efforts on the part of such organizations as the American Association of Junior Colleges, the National Council of Technical Schools, the Technical Institute Council of the American Society for Engineering Education, and the Engineering Manpower Commission of the Engineers Joint Council, but the message does not come through loud and clear at the level of the personnel manager or owner-manager in business and industry.

Guidance and Counseling. The guidance movement, though much emphasized in education in recent years, has not made the full contribution of which it is capable. Student personnel workers identify three broad areas of guidance: career (or vocational) guidance, educational guidance (or advisement), and personal guidance (counseling on personal or emotional problems). Without entering into a discussion of the possible reason for misplaced emphasis, it is a matter of common observation that at both high school and post-high school levels educational advisement claims the lion's share of counselor time. Putting students in courses, checking to see that their schedule of classes fits in with the requirements of a four-year college, and indeed even "recruiting" for a particular college are tasks which seem to absorb counselor time almost to the exclusion of meaningful participation in career guidance. Exacerbating the problem is the fact that most guidance counselors have themselves never had more than a nodding acquaintance with any field of work outside of education.

The American High School. Great as has been the contribution of the high school to American life, it has not sufficiently modified its philosophy nor its programs to fit the needs of today's youth. Most high schools today still put major emphasis on their college preparatory function. The printed catalog might not indicate this, and the school's principal might vehemently deny it, but actual analysis reveals that in the typical "comprehensive" high school two-thirds of the courses offered and probably two-thirds of the effort expended are directed to the interests and needs of the one-third of the students who will one day matriculate at a four-year college in a baccalaureate degree program. In an editorial in School Shop for September, 1966, the problem is placed in sharp focus:

> This is the way the situation currently stacks up. Of a hundred ninth-graders about 76 will graduate from high school. The other 24 drop out. Of the 76 who graduate, about 40 will enter college. The other 36 will enter the work force or military service, become housewives, or become unemployed.
>
> Of the 40 who enter college, about half will not complete either a two-year associate degree program or a four-year baccalaureate program. (Emphasis added.)
>
> Obviously the high school that places major emphasis on the college-bound program is not serving adequately the needs of at least two-thirds of the youth it is organized to serve. Variations in the above figures will occur from school to school, but the problem is present in every school.
>
> Meeting the educational needs of this group is not an easy matter. Educational tradition, the accrediting agencies, institutional prestige, and much of the vocal public create roadblocks.[67]

One must not be too ready to assign all the blame for this situation to high school faculty and staff, however. Sincere efforts by high school curriculum planners often produce little change because of factors mentioned previously, such as peer pressure, social attitudes, and family aspirations. But regardless of where the fault lies, the American high school is still predominantly a college preparatory school. Its pedagogy and its curriculum today, when 80 to 90 percent of the age group is enrolled, are very much as they were in the 1920's when only a selected 25 percent of the age group was enrolled.

Recent developments hold some hope for improvement. Contiguous high school districts are creating area vocational centers where vocational education can be offered by qualified faculty in well-equipped facilities to students who retain student body membership in, and complete graduation requirements at, their home high schools. Such area schools can share in Federal funds under Public Law 88-210, the Vocational Education Act of 1963.[68]

Furthermore, a significant number of high schools are beginning to offer a new kind of "college prep" program--a curriculum which prepares the student for entry into a community college or technical school to pursue an occupational education program offering an associate degree.[69] As two-year colleges increase in number to the point where one will be located within reasonable commuting distance of almost all youth,[70] vocational education (in the sense of actual job preparation for immediate employment upon graduation from high school) may become even less of a concern than it is now, and two tracks of college preparatory education may appear in most high schools--one which prepares the most academically able students for entry into liberal arts and pre-professional studies in colleges and universities, and one which prepares most of the rest of the students for entry into a junior college or technical school occupational education program.

Faculty Shortages. Throughout higher education it is assumed that a shortage of qualified faculty will hamper growth for at least a decade to come. Opinion on this point is not unanimous, but majority opinion agrees that it is a serious problem. Perhaps the key word here is "qualified." It may indeed be possible to find enough "warm bodies" to staff the classrooms of the higher education establishment during the coming decade, but there is no comfortable statistic available which assures us that we can accommodate doubled enrollments between now and 1975 and not sacrifice the quality of the teaching staff. Furthermore, the quality level now is not one with which we should be content, and it is unsettling, to say the least, to contemplate a further deterioration.

The faculty problem is particularly acute in the occupational education fields. Colleges and universities, in general, prepare teachers to teach what is taught in colleges and universities (or, what is taught in high schools to prepare for college). The flow of persons into teaching from business and industry, though appreciable, is not large, and there is no evidence to suggest that it will increase. As junior college and technical school programs expand, the need for teachers of technical subjects will grow apace. A recent informal study[71] conducted by the author among Michigan's 23 community junior colleges revealed that their five-year projections of faculty needs included the following: teachers of engineering subjects, 37; teachers of technical specialty subjects, 128; teachers of supporting theory courses (mathematics, physics, chemistry, etc.), 122; and director, dean, or coordinator of technical education, 36. Extrapolating these needs from 23 colleges to the national scene, which will involve nearly 1,000 two-year colleges by 1972, gives a sobering picture of the road ahead.

A few teacher-training institutions have instituted specialized teacher-education programs for two-year college occupational fields. Most common are programs to train teachers of engineering technology and industrial technology, nursing and one or two other health-related technologies, and business education teachers. However, the output from all these programs is currently only a trickle when the demand for teachers can be satisfied only by a freshet.

Administrators (deans, coordinators, division chairmen) for technical-vocational education programs are also in critically short supply. Junior colleges and technical schools attempt to fill these positions by pirating able persons from the secondary schools, by taking good teachers out of the classroom, and by recruiting (without much success) within business and industry. The University of Michigan, with partial support from the Carnegie Corporation and the U.S. Office of Education, has established a Leadership Development Program for the express purpose of identifying promising young persons who are interested in administrative careers in technical-vocational education.[72]

The problem of faculty supply and demand should not be left without some discussion of innovations in learning and teaching. Obviously, one method of dealing with the supply-demand situation is to divide the continually increasing student body by 20 (assuming a student-to-faculty ratio of 20:1) and simply round up enough persons--qualified or unqualified--to "staff the classroom lecterns." Some colleges are seriously considering another method, which accepts as a fact that qualified faculty will be in short supply. Instead of expending their energies in an ever-widening search for teachers (many of whom will possess only marginal abilities), the staff at these colleges is exploring ways in which qualified faculty can serve more students.[73]

If students learn when teachers "teach," the teacher is effective. But if students can learn without the teacher's teaching, or if 300 students can learn simultaneously from his teaching where only 30 learned before, then that teacher is a real professional. Through the use of new media, especially equipped learning forums and learning laboratories, teaching machines, programed materials, and a shift of emphasis from teaching (i.e., lecturing to students in groups of 25 to 30) by the teacher to learning by the student, a number of colleges are today experimenting with the second of the above possible solutions to the faculty shortage.

Certainly there can be no magic in class sizes of 30 to 40 students. It is at least possible that groups of this size are the most inefficient which could be assembled. Such groups are too large for a seminar-discussion approach and much too small for an all-out multi-media approach. Given good acoustics, good sight lines, comfortable seating, engineered lighting, advanced audiovisual techniques (perhaps including closed-circuit television with monitors distributed about the forum to give close-up views of demonstrations) and a group of technical assistants, the master teacher can instruct 300 students just as easily (and probably with far greater impact) as he can 30 students.

There is no known law which proclaims that the wisdom acquired by each student is equal to the wisdom of the teacher divided by the number of students present.

V. NEEDED RESEARCH AND ACTION PROGRAMS

The literature of "vocational education"--that is, secondary level, Smith-Hughes-type, federally reimbursed vocational education--is vast indeed. At postsecondary levels, however, the literature is quite meager, due in part to the relatively short history of collegiate-technical education. The Wickenden-Spahr report dates back only some 30 years, and the active commitment of the public junior college to technical-vocational education is less than two decades old. Most of the books on collegiate-technical education have already been cited, and they will be briefly annotated in the bibliography at the end of the chapter. Research studies have been referred to from time to time in the foregoing, and the relative scarcity of the references is merely acknowledgement of the fact that research has not been a major factor in the development of technical-vocational education in colleges.

Much research is needed--research which will produce the hard answers to the hard questions. As a group of technical educators, we have by necessity been flying by the seat of our pants. The state of the traffic around us is now such that we must shift over to instruments and set our future course with the aid of more and better research results.

The following is a listing, by no means exhaustive, of some of the areas in which research-in-depth and action projects need to be undertaken.

1. Studies of the real demands of entry jobs in many different businesses and industrial fields, and how these job demands can be translated into curriculum and course content.

2. A massive, scholarly, no-holds-barred inquiry into the suitability (or lack of it) of the union-controlled apprenticeship system in the United States. Such an inquiry is long overdue.

3. Up-dated studies of the kinds, levels, and extent of industry-operated education and training programs.

4. Studies of the utilization of semiprofessional and technical manpower by both private and public sectors of the economy--the status of the technician in public and private employment.

5. Projects exploring the suitability of programed learning and the "new media" of educational technology for instructional programs in technical-vocational education. Studies of "learning forums" and learning laboratories.

6. Controlled experimental studies to evaluate the importance of

general education content in collegiate-technical curriculums. Such studies should also indicate how general education courses for collegiate-technical students might (should) be different from the "transfer" liberal arts courses offered as a standard part of the curriculum by most two-year colleges.

7. A cooperative project with long-term goals and massive financing which would establish models for "open-ended curriculums"--programs which would prepare for job competence on the one hand, but would also be largely "transferable" to some four-year colleges should the associate degree technician decide later to work for a baccalaureate degree.

8. Action projects to prepare teachers and administrators for institutions engaged in post-high school collegiate-technical education.[74]

9. Studies of the feasibility of a freshman year core curriculum for technician programs--perhaps the same general education core for all students, plus a basic core within the field-oriented occupational curriculum.

10. A regional pilot program (perhaps for an entire state) to develop and evaluate the so-called pre-technical or fourth-track for high schools in areas where large numbers of high school graduates will enter occupational education programs in a regional two-year college.

11. Action projects to change attitudes commonly held by public

school teachers and counselors (and parents) about technical-vocational education. Such projects or studies will have to reach down into the early elementary school grades and might involve the introduction into the curriculum of some practical arts studies for all boys and girls.[75] Somehow youngsters must be brought to an early realization that there are other abilities than the purely cognitive, and that schools can be concerned with the interests and abilities of all youth, not just those of the "good students" in the academic sense.

12. Additional studies by educational economists which will yield trustworthy information on the economic value of two-year collegiate-technical programs, both to the individual himself and to society.[76]

13. Follow-up studies on graduates of associate-degree collegiate-technical programs over a five-year period and in several different regional settings to gather data to be used for curriculum development and guidance purposes.

14. Continuing studies on automation and technology, with implications, on the one hand, for new jobs and educational programs; and, on the other hand, for obsolescence of skills and associate training programs. We need definitive research on the probable effect of automation on "middle manpower" jobs.

15. An action project, perhaps to be undertaken jointly by the U.S. Department of Labor and the U.S. Bureau of the Census, to reclassify

jobs and job clusters, so that the "middle manpower" group of jobs could be accurately studied. For example, the present classifications, Professional, technical and kindred, and Managers, officials, and proprietors, include both professional workers and semiprofessional and technical workers. And the classifications, Clerical and kindred, Sales workers, and Craftsmen, foremen and kindred, include workers at skilled, technical, semiprofessional, and perhaps even professional levels.

What is needed is a new occupational classification scheme which will make it possible to extract from census and other data pertinent information on all workers in all industry, business, and service groups, whose level of work lies between that clearly designated as "professional" and that recognized as "skilled." The present classification system perpetuates the myth that masses of "workers" are managed, directed, and led by a small elite group of professionals.

This suggestion ends the list for purposes of emphasis. High priority should be given to such a project. "Middle manpower" is of tremendous importance in the further economic development of the nation. At least one-fourth and perhaps as much as one-third of the labor force will be working at middle manpower jobs in the 1970's. But we continue to pretend that this segment of the labor force does not exist by retaining the present and obsolete occupational classification system.

VI. SUMMARY AND CONCLUSIONS

Technical-vocational education in the United States is finally on the threshold of acceptance. Controversy and misunderstanding are still prevalent, and the vested interests of academicians, on the one hand, and die-hard vocationalists, on the other, inhibit an orderly and rapid movement of occupational education programs into the realm of higher education. It would appear, however, that higher education will increasingly become an instrument for manpower development and that much of the total task of vocational-technical education will shift from secondary levels to collegiate levels in the next decade. There remains the possibility, of course, that a new system of vocational-technical schools may develop (postsecondary, but not collegiate in level) in many states. Such a development, though its short-run advantages can be rationally argued, takes vocational education out of the mainstream of education and sets it apart in a never-never-land of no credits, no degree, and (probably) no status.

A great unmet need is for action research on the problems of vocational-technical education. Some of the needed research has been indicated above. One common fault of much recent research (as pointed out by the A. and M. university president referred to earlier) is that it has lacked applicability to specific problems in need of solution. We can hope that research projects of the future will set patterns for action, particularly at postsecondary levels of technical-vocational education.

The selected annotated bibliography which follows will, it is hoped, be of sufficient scope to enable researchers to get a rough measure of the dimensions of the problem and to guide them to an ordered search of the literature.

FOOTNOTES

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6. Ibid., p. 1.

7. Ibid., p. 26.

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9. Technology and the American Economy, op. cit., p. 29.

10. Ibid., p. 31.

11. Ibid., p. 110.

12. See ibid., p. 45-47, for the complete list.

13. Ibid., p. 46.

14. Ibid.

15. Ibid., p. 7.

16. Ibid., p. 6.

17. Data extracted from U.S. Census (1940); also from Special Labor Force Report No. 28, Employment Projections by Industry and Occupation, 1960-1975. Washington, U.S. Department of Labor, 1963.

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20. National Science Foundation, Scientists, Engineers, and Technicians in the 1960's. Washington, U.S. Government Printing Office, 1964.

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22. Actually, nationwide, in the 1960's out of every 100 ninth-graders, 76 will graduate from high school. The greatest drop-out is in the tenth grade.

23. See Carl Schaefer and Robert E. McCord, "Needed: A Definition of the Technician." Technical Education News, vol. 22, p. 23-24. June, 1963.

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25. Quoted from Harbison and Myers, op. cit., p. 16.

26. Grant Venn, Man, Education, and Work: Post-Secondary Vocational and Technical Education, p. 1. Washington, American Council on Education, 1964.

27. Mortimer J. Adler and Milton Mayer, The Revolution In Education, p. 102. Chicago, University of Chicago Press, 1958.

28. Ibid., p. 103.

29. Brubacher, op. cit., p. 58.

30. Quoted from Sec. 8(1) of Public Law 88-210, Vocational Education Act of 1963.

31. Education For a Changing World of Work. Report of the Panel of Consultants on Vocational Education, OE-80021. Washington, U.S. Government Printing Office, 1963.

32. Quoted from an address delivered to the American Vocational Association, Chicago, December 7, 1959.

33. For a detailed analysis of some of the critical problems, see Norman C. Harris, "Redoubled Efforts and Dimly Seen Goals." Phi Delta Kappan, vol. 46, p. 8. April, 1965.

34. The material for this section is extracted from the column by Theodor Schuchat, "From Washington." School Shop. September, 1966.

35. N. H. Frank, Summary Report of The Summer Study on Occupational, Vocational and Technical Education. Cambridge, Mass., Massachusetts Institute of Technology, 1966.

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37. Mary Conway Kohler, Excluded Youth: Idle or Trained?, p. 3. Washington, Center for Metropolitan Studies, 1962.

38. See Ken August Brunner, Guide to Organized Occupational Curriculums in Higher Education. Washington, U.S. Office of Education, 1965.

39. For the more restricted meaning, see American Society for Engineering Education, Characteristics of Excellence in Engineering Technology Education, p. 12. Washington, 1962. For the broader definition, see Harris, Technical Education in the Junior College, op. cit., p. 35-42.

40. For a quick look at the variety of business education programs offered in junior colleges, see "Business Education Enrollments in California Public Junior Colleges." California Schools, vol. 34, No. 5. May, 1963.

41. See Robert E. Kinsinger, Education for Health Technicians--An Overview. Washington, American Association of Junior Colleges, 1965. Also see U.S. Department of Labor, Manpower Administration, Health Careers Guidebook. Washington, U.S. Government Printing Office, 1965.

42. 1966 Junior College Directory. Washington, American Association of Junior Colleges, 1966.

43. Semantics is somewhat of a problem in the junior college movement. The term "junior college," since it originally was descriptive of an institution concentrating on lower-division academic work, has become less frequently used, and the term "community college," or the more awkward "community junior college," is gaining favor in some regions of the country. Some persons feel that the term "community college" is descriptive of greater comprehensiveness of program and that "junior college" implies a single-purpose academically oriented institution. These distinctions are of regional significance only, for some of the most comprehensive institutions in the nation call themselves "junior colleges," and by no means are all self-styled "community colleges" fully comprehensive.

44. Brunner, op. cit.

45. National Science Foundation, Scientists, Engineers, and Technicians in the 1960's, op. cit.

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51. Leo F. Smith and Lawrence Lipsett, *The Technical Institute*. New York, McGraw-Hill, 1956.

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61. Donald D. Dauwalder, *Education and Training for Technical Occupations*, p. 31. Los Angeles, Los Angeles City Junior College District, 1962.

62. *Ibid*., p. 55.

63. *Occupational Education Bulletin*, vol. 1, No. 6. October 15, 1966.

64. See Venn, *op. cit*., p. 109-11.

65. Secretary of Defense Robert McNamara has recently announced a plan for expanded basic education in the Army. See *Phi Delta Kappan*, vol. 48, No. 2, p. 49, 94. October, 1966.

66. Venn, op. cit., p. 110.

67. Editorial, School Shop, vol. 26, No. 1. September, 1966.

68. See Sec. 8(2) of Vocational Education Act of 1963.

69. See The Richmond Plan. Report of a study by the Richmond, Calif., Union High School District and the Cogswell Polytechnical College. San Francisco, 1962. Also Norman C. Harris and William Yencso, Technical Education in Michigan Community Colleges. Ann Arbor, School of Education, University of Michigan, 1965.

70. A development recommended by both of the President's Commission reports (Truman and Eisenhower) and by the Educational Policies Commission of the NEA.

71. Unpublished questionnaire study conducted by the author at the Center for the Study of Higher Education, University of Michigan, Ann Arbor, 1965.

72. Ralph C. Wenrich and Lewis H. Hodges, Experimental Program for the Identification, Selection, and Development of Persons for Leadership Roles in the Administration and Supervision of Vocational and Technical Education. Ann Arbor, Office of Research Administration, University of Michigan, 1966.

73. For a round-up on innovation in junior colleges, see Junior College Journal, vol. 37, No. 2. October, 1966.

74. Such projects and programs are already underway at a number of colleges and universities. The list following is merely illustrative, not all-inclusive: Oklahoma State University, Rutgers, Southern Illinois University, University of Missouri, University of Illinois, Florida State University, University of Michigan, Ohio State University, University of Wisconsin, and U.C.L.A.

75. Massachusetts Institute of Technology, Summary Report of the Summer Study on Occupational, Vocational, and Technical Education, p. 3. Cambridge, Mass., Science Teaching Center, 1965.

76. The work of Schultz, Denison, and Becker should be extended, and studies specifically oriented to the two-year college graduate should be undertaken.

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This report defines "engineering technology" and the "engineering technician" from the ASEE point of view and distinguishes between "quality" and "level" of programs. Faculty, students, and curriculums for engineering technology curriculums are discussed. The report relates basic sciences and mathematics to technical specialty courses, skill courses, and general education courses. A very useful pamphlet for persons in colleges planning programs in engineering technology. Address: ASEE, Dupont Circle Building, 1346 Connecticut Ave., N.W., Washington, D.C.

27. ________________, Technician Career Opportunities in Engineering Technology. New York, Technical Education News, 1965. 20 p.

This is the definitive career brochure on the engineering technician. It describes the engineering technology occupations and the kinds and levels of collegiate-technical education required to prepare for these occupations. Address: Technical Education News, 330 W. 42nd St., New York, N.Y.

28. B. F. Goodrich Company, A Study of the Scientific Manpower Problem of the United States. Akron, Ohio, 1956.

A carefully conducted, well-documented, and well-illustrated research report on the current status of and future need for engineering and scientific manpower. It points to the relative (i.e., percentage) drop in enrollments in science and engineering in the 1950's and relates national economic growth to the contributions of scientists and engineers. Although somewhat outdated, the projections run into the 1970's and many of the findings are pertinent to today's technical education problems.

29. Barach, Arnold B., U.S.A. and Its Economic Future. New York, Macmillan, 1964.

A graphically portrayed analysis of the current status and projected future of the U.S. Economy. Implications for jobs and occupational education are implicit in every section.

Statistical information in the form of charts, graphs, and tables is included on most every phase of the U.S. economy. An excellent source book for educators.

30. Barlow, Melvin L., "A Survey of Junior College Work Experience Education Programs." Los Angeles, Division of Vocational Education, University of California at Los Angeles, 1963. 90 p. Multilithed.

An analysis of the current (1963) status of work-experience education programs in 18 California junior colleges. The problems are delineated as well as the promise of such programs.

31. ________________, and W. J. Schill, The Role of Mathematics in Electrical-Electronic Technology. Los Angeles, Division of Vocational Education, University of California at Los Angeles, 1962. 132 p.

A report based on an extensive research study of the competencies and skills needed by technicians in the electrical/electronics industries of California. Special emphasis is given to an inquiry into the level and kinds of mathematical knowledge actually needed by technicians on the job.

32. ________________, and ________________, The Role of the Physical Sciences in Electrical-Electronic Technology. Los Angeles, Division of Vocational Education, University of California at Los Angeles, 1965. 64 p.

A progress report on a research project being conducted among working technicians, their supervisors, and junior college instructors of electronics technology.

33. Center for Research and Leadership Development in Vocational and Technical Education, Guidance in Vocational Education: Guidelines for Research and Practice. Columbus, Ohio State University, 1966. 181 p.

A report of a National Interdisciplinary Seminar held at Ohio State University, January 1966. Highly important for guidance counselors in high schools and two-year colleges.

34. Center for Studies in Vocational and Technical Education, the University of Wisconsin, Industrial Relations Research Institutes, Vocational-Technical Reports. Madison, Wis.

A series of publications, issued periodically, as ready, covering the ongoing research at this center. Among the recent "Reports" is a series of bibliographies on such topics as administration, curriculum, technological change, and job-cluster analysis. The series now contains 18 well-developed bibliographies.

35. Center for Vocational and Technical Education, Ohio State University, "Business and Office Education, Research Planning." Columbus, Ohio State University, March 1966. 116 p. Mimeographed.

An analysis of research needed in the field of business education, determined after a conference in which seven position papers were presented by national leaders in business education, business management, and business systems analysis.

36. Chamber of Commerce of The United States, The Development of Our Manpower Resources. Washington, 1965. 24 p.

The role of post-high school occupational education is stressed throughout this booklet as the key to employment for individuals, on the one hand, and to meet the nation's manpower needs, on the other.

37. _______________, Target: Employment. Washington, March, 1964. 95 p.

The booklet contains 35 typical examples of action programs undertaken by local chambers of commerce in cooperation with local schools and colleges. Many of the action programs described have to do with the establishment of technical-vocational programs at post-high school levels. This is an excellent source of information for educators seeking a partnership with local business and industry to develop programs of education for youth and adults.

38. Community College System, University of Hawaii, Curriculum Development for Hawaii's Community Colleges, by Norman C. Harris. Honolulu, 1964. 110 p.

This report is the result of a two-month planning study for a new community college system. Included are suggestions and sample instruments for community surveys and suggestions for a core curriculum concept for occupational education.

39. Detroit Board of Education, The Need for Technicians in the Automotive Manufacturing Industry in the Detroit Metropolitan Area, by Melvin C. Kavieff. Detroit, Detroit Board of Education, 1962. 325 p.

Major auto manufacturing firms and hundreds of smaller firms manufacturing parts and components were surveyed either by interview or questionnaire. Data on technician job requirements, desired education and training, conditions of employment, attrition and turnover, salary and promotion, and on suggested educational programs were obtained. It is an excellent example of a detailed study of one industry and its needs for trained manpower.

40. Educational Policies Commission, National Education Association, Manpower and Education, Washington, 1956. 128 p.

A report in three parts on America's manpower problem and the role which education can play in both the present and the future. Although now more than 10 years old, this report is still very useful for educational planners. Many present-day problems would not exist, or at least would have been ameliorated, had its recommendations been thoroughly implemented. Address: NEA, 1201 16th St., N.W., Washington, D.C.

41. ________________, Universal Opportunity for Education Beyond the High School. Washington, 1964. 36 p.

A philosophically based statement, laced with some insight into the educational needs of the nation in the decades ahead. The commission takes the point of view that as we near the goal of "a high school education for all youth," the goal itself is inadequate. Although the new goal of the commission--two years of education beyond the high school, for all high school graduates--is worthy of consideration, this reviewer questions the stipulation "for all high school graduates." Adding to the lack of realism of the commission's position is their statement that the two post-high years should be "aimed primarily at intellectual growth."

42. Graduate School of Business Administration, Harvard University, Managing Technician Manpower, by James T. Brady and William Moran. Scarsdale, N.Y., Technician Manpower Associates, 1959.

A classic study of the utilization of technician manpower in industry. The technician is defined in terms of the work he does, and degrees of education for various levels of technology are proposed. The technician's niche in private industry is discussed.

43. Harris, Norman C., and William R. Yencso, Technical Education in Michigan Community Colleges. Ann Arbor, School of Education, University of Michigan, 1965. 142 p.

This is a research study on the current status of collegiate-technical programs in Michigan's community colleges, together with a feasibility study on the problem of establishing pre-technical programs in high schools. A major problem identified relates to the lack of status of the technician in Michigan industry. Suggestions for improving this situation are made, together with a summary of the suggestions of high school counselors on the general problem of articulation between secondary schools and colleges offering technical-vocational programs.

44. Los Angeles City Junior College District, Education and Training for Technical Occupations, by Donald D. Dauwalder. Los Angeles, Los Angeles City School District, 1961. 166 p.

Part I is a study of industries and existing educational and training facilities in the San Fernando Valley of Southern California with particular emphasis on the education and training of technical personnel. Part II is a guide for curriculum development and student counseling. This is a very good source for community junior colleges and technical institutes planning to initiate or expand technical education programs. One of the half-dozen truly authoritative studies made of education-industry interdependence in a modern urban complex. Address: 456 N. Grand Ave., Los Angeles.

45. The Manpower Research Council, Research Report Number Three: National Job Availability. Milwaukee, July, 1966.

A brief report on an informal survey of 773 corporations throughout the United States. Out of a total of 873,042 jobs reported (filled and unfilled), 35,038 were reported as unfilled, or 4 percent of the total number of jobs in the respondent companies. Job vacancies most frequently reported were, in order of frequency: machinists, salesmen, secretaries and stenographers, mechanical engineers, and draftsmen. Nearly 40 percent of the respondents blamed the applicant's lack of requisite skills for the job vacancy problem. Address: 820 N. Plankinton Ave., Milwaukee.

46. March, Georgianna B., ed., *Occupational Data Requirements for Education Planning*. Madison, University of Wisconsin, Center for Studies in Vocational and Technical Education, 1966.

A collection of prepared papers and respondent reactions from a conference conducted at the University of Wisconsin, June 15-16, 1965. A distinguished group of educators, economists, and government agency heads participated. Major section headings of the report are: (1) "The Occupational Data Requirements for Education Planning," (2) "The Role of Technological Forecasting in the Development and Use of Manpower," (3) "Foreign Experience in the Utilization of Occupational Data for Education Planing," and (4) "Evaluation of Occupational Data and Their Use in Occupational Planning." This is an excellent source of current information on the national and international scene with regard to the need for manpower development and the use of manpower data for educational planning.

47. Massachusetts Institute of Technology, *Final Report of the Summer Study on Occupational, Vocational, and Technical Education*. Cambridge, Mass., Science Teaching Center, M.I.T., August, 1965. 121 p.

This is a report summarizing the deliberations of a six-week conference on vocational education held at M.I.T. during the summer of 1965. The conference was directed by N. H. Frank, professor of physics. The essential thrust of the report is that vocational education must be brought into the mainstream of American education--that dichotomous perceptions of the past must disappear, that dualism in education is dead, and that all education, including vocational-technical education, "should be concerned with all the capacities of an individual, including the intellectual, the manipulative, the creative, and the social."

48. Michael, Donald N., *Cybernation: The Silent Conquest*. Santa Barbara, Calif., Fund for the Republic, 1962. 48 p.

A searching inquiry, sponsored by the Center for the Study of Democratic Institutions, into the economic, manpower, political, and sociological implications of the technological revolution. "Cybernation" is defined as "the systems integration of automation and computers." The advantages of cybernation are given a brief analytical treatment, but most of the monograph is devoted to the problems of cybernation. The possibility of government control of cybernation is also discussed. The principal weakness of the author's argument that cybernation is more of a threat than a promise is the tacit assumption that the new cybernetic revolution will have its impact on an otherwise static society.

49. Michigan State University, *Education for Economic Opportunity*. Educational Service Series, No. 12. East Lansing, Mich., Bureau of Educational Research Services, College of Education, June, 1965.

A research study to determine the feasibility of establishing one or more area vocational-technical schools in a five-county area in northwestern Michigan.

50. National Center for Advanced Study and Research in Agricultural Education, Ohio State University, *Report of a National Seminar on Agriculture Education--Preparing Agricultural Technicians*. Columbus, Ohio, 1964. 188 p.

This seminar report notes the rapid disappearance of "farm laborers" and the concurrent new need for technicians to work in support of modernized agriculture.

51. National Commission on Technology, Automation, and Economic Progress, *Technology and the American Economy*. Volume I. Washington, U.S. Government Printing Office, 1966. 115 p.

The commission was established by P.L. 88-444 and members were appointed by the President in December, 1964. Chaired by Howard R. Bowen, the commission was made up of distinguished national leaders in such fields as communications, labor, private industry, finance, urban problems, civil rights, higher education, and government. The report itself deals with the far-reaching problems of technological change in the United States. This is an extremely valuable document for educators--not one whose conclusions should be accepted wholesale, but one whose arguments should be weighed carefully. The role of higher education in the development of manpower is sharply delineated.

52. National Council of Technical Schools, *Engineering Technology Careers*. Publication No. 1065. Washington, 1966. 33 p.

Background information on technical institutes and the role of the technician. Up-to-date information on 13 different fields of engineering technology. Address: 1507 M St., N.W., Washington, D.C.

53. National Education Association. "Education and Automation: The Coming World of Work and Leisure," *Bulletin of the National Association of Secondary-School Principals*, vol. 48, No. 295. November, 1964.

The entire issue is devoted to the subject of education and automation. The separate papers were prepared by national leaders in economics, education, business, government, and science. The papers are thoughtful analyses backstopped by substantial facts and figures. Proposed solutions to problems are not clear-cut, but at least some guidelines are established. The issue is theoretical enough to be challenging and practical enough to be useful. Address: 1201 16th St., N.W., Washington, D.C.

54. National Industrial Conference Board, Economic Potentials of the United States in the Next Decade. New York, 1966.

Assuming that a specified set of economic and noneconomic conditions will prevail over the next decade, this report attempts to describe what the American economy will be like in 1975. Much attention is given to the development of human resources, and to the growth of the labor force. Not much attention is given to education and training at post-high school levels, but the report is a good source of economic information for planners in education. Address: 845 Third Ave., New York.

55. National League for Nursing, "Statistical Data: Associate Degree Programs in Nursing, 1966." New York, Department of Associate Degree Programs. 12 p. Multilithed.

Complete statistical and graphical information on the development and current status of two-year associate degree programs in nursing. From fewer than 20 programs (colleges) in 1955, the ADN program has grown until in 1966 nearly 170 two-year colleges were offering the program. More than 11,000 students were enrolled in the fall of 1966. Address: 10 Columbus Circle, New York.

56. Organization for Economic Cooperation and Development (OECD), Higher Education and the Demand for Scientific Manpower in the United States. Paris, 1963.

One in a series of reviews of scientific manpower and education, this report surveys the supply and demand situation in the scientific and technical manpower field in the United States during the early 1960's and points up the responsibilities and assesses the capabilities of higher education to provide the needed manpower. The "Examiners" (authors of the report) were three distinguished professors from Europe--one from Oxford, one from Cambridge, and one from Stockholm University.

57. Rutgers University, The Advanced Degree and Vocational-Technical Education Leadership. New Brunswick, N.J., Department of Vocational-Technical Education, 1966.

A collection of papers presented by persons from several disciplines--economics, sociology, psychology, labor relations, and vocational education which purports to "structure" a better program for the doctoral degree in vocational-technical education. As might be expected, when vocational educators ask sociologists, psychologists, economists, and labor experts what vocational educators should study, the answer tends to be sociology, psychology, economics, and labor relations.

_______________, Technology-Resource Center for Vocational-Technical Education. New Brunswick, N.J., 1964. 19 p.

A plan for a teaching-learning center and instructional resources center for vocational-technical education. A panel of technical education leaders joined forces with an architectural consulting firm to produce the suggested plan.

58. Scientific Manpower Commission, Scientific, Engineering, Technical Manpower Comments. Washington, Scientific Manpower Commission and the Engineering Manpower Commission.

A monthly "report from Washington" on a wide range of matters concerned with scientific, engineering, and technical manpower. Actions by private industry, by associations, by the Congress, by the military forces, and by educational institutions are reported. New books and reports on manpower are reviewed. Address: 2101 Constitution Ave., N.W., Washington, D.C.

59. Southern Regional Education Board, The Community College in Mental Health Training: A Report of a Conference. Atlanta, 1966. 92 p.

A compendium of position papers, working papers, and major addresses to the conference. Conference participants were invited from the mental health leadership group, and from community colleges throughout the southern states. Conference delegates from the mental health professions indicated that the need for mental health workers is urgent and that many positions in the mental health field can be very satisfactorily filled by persons with only one or two years of post-high school education.

60. _______________, Technical-Vocational Education and the Community College. Atlanta, 1964. 81 p.

A compilation of prepared papers by national leaders in the community college movement, presented to an audience drawn from education, government, and the private sector of the economy from all the states in the

SREB area. A worthwhile document for persons or groups planning for community junior college systems or units which will emphasize the provision of semiprofessional and technical education in one- and two-year post-high school programs.

61. Texas A & M College, Survey of Technical Occupations. College Station, Texas, Engineering Extension Service, 1959. 135 p.

A report on a statewide survey to determine the need for industry- and engineering-related technicians. The desired levels and kinds of training are also assessed, and projections were made as to the facilities required to provide the training.

62. University of Michigan, "Experimental Program for the Identification, Selection, and Development of Persons for Leadership Roles in the Administration and Supervision of Vocational and Technical Education," by Ralph C. Wenrich and Lewis H. Hodges. Ann Arbor, School of Education, 1966. 82 p. Multilithed.

A report on an action project during its second year. The project features a concentrated eight-week summer institute for a selected group of persons nominated by school administrators as having demonstrated "leadership potential." The summer workshop is followed by drive-in conferences once a month throughout the following year.

63. University of Pittsburgh, Project Talent--One Year Follow-Up Studies. Cooperative Research Project No. 2333, Pittsburgh, School of Education, 1966. 250 p.

This is a report of the one-year follow-up studies of the original 1960 Project Talent sample, undertaken when the subjects were one year out of high school. Chapters 5, 6, and 7 relate to post-high school education, and Chapter 8 to the career plans of the Project Talent group. Appendices are included.

64. University of Wisconsin, Annual Report of the Center for Studies in Vocational and Technical Education. Madison, Wis., Industrial Relations Research Institute, November, 1965.

The annual report, prepared by the center staff, reviews the first year's operations (October, 1964, through October, 1965) of the center at the University of Wisconsin. A complete listing of research completed and research in progress is included. Among studies completed, the following has application to post-high school occupational education:

"Effects of Local Opportunities for Post-High School Education upon Plans of High School Graduates." A number of the studies in progress will yield data which should be useful to colleges planning technical-vocational programs.

65. Wayne State University, Mathematical Expectations of Technicians in Michigan Industries. Detroit, Department of Industrial Education, College of Education, 1966. 58 p.

This report grows out of the doctoral research of Norman G. Laws, a faculty member at Henry Ford Community College, Dearborn, Mich. It is an excellent analysis, based on research conducted in Michigan's industrial complex, of the actual mathematical knowledge and skills expected of technicians in the kinds of industries represented by the sample.

Publications of The United States Office of Education and of Several State Education Agencies

66. California State Department of Education, A Study of Technical Education in California--Guidelines for the Development of Technical Education Programs in the Junior College, by Herbert S. Wood. Sacramento, 1959. 122 p.

This study describes the need for technical education and traces the development of technical education in the United States as well as in California. It gives guidelines for curriculum planning and for making industry surveys.

67. ________________, "Impact of Automation on Office Occupations." Sacramento, 1962. 44 p. Mimeographed.

Three regional conferences were held, the participants being business educators and office managers, personnel managers, and other representatives of industry and business, large and small, throughout California. Findings were that automation has not decreased the need for office workers, and that automation has brought the need to teach many office workers new skills and broadened concepts of business management. The demand for secretaries, stenographers, and typists has not been affected at all by automation. However, the education and training of the secretary should be more broadly comprehensive than ever before. Automation has brought a demand for many new kinds of office machine operators.

68. ________________, Mathematics and Science Competencies for Technicians, by Lawrence H. Stewart and Arthur D. Workman. Bulletin No. 12, vol. 29. Sacramento, 1960.

A study of the training of electronics and chemical technicians with special emphasis on the critical incident technique in determining actual levels of science and mathematics required. A very good source of information for planning applied mathematics and applied science courses for technicians.

69. Kansas State Department of Education, The Training Needs of Highly-Skilled Technicians in Twenty-Three Selected Manufacturing and Processing Firms in Kansas, by Merle W. Bodine. Topeka, Kansas State Board for Vocational Education, 1959. 138 p.

This report delineates the areas of technical skill and knowledge required of presently employed technicians in 42 different technical occupations in 23 selected Kansas firms.

70. New York State Department of Labor, Technical Manpower in New York State. Volume 1 with Supplements A and B, and Volume 2. Albany, Division of Research and Statistics, 1964.

These four separately bound volumes constitute perhaps the most thorough study yet completed anywhere on the subject of technical manpower. Industrial needs for technicians, educational requirements, pay and promotion, different levels of technicians, utilization of technicians, availability of schools and colleges, and employer training of technicians are all explored in detail. The discussions are supported by complete statistical data from research findings.

71. New York State Education Department, Needed--Industrial Technicians: An Expanded Technical Education Program for Greater Syracuse, Syracuse, State Education Department and Syracuse Board of Education, 1960.

A brief survey report on the attitudes of students, parents, educators, industrialists, businessmen and citizens in general on the need for increased numbers of technicians and for expanded technical education opportunities.

72. U.S. Office of Education, Criteria for the Establishment of 2-year Colleges, OE-57000, by D. G. Morrison and S. V. Mertorana. Washington, U.S. Government Printing Office, 1961.

This study lists criteria for establishing two-year colleges presently found in state laws and regulations, summarizes opinions and experiences of persons who have planned and initiated community junior colleges, and suggests guidelines in organizing state systems of comprehensive two-year colleges.

73. ________________, Education for a Changing World of Work, Washington, U.S. Government Printing Office, 1963.

The report of the "Willis Committee," a panel of consultants on vocational education, to President Kennedy. It emphasizes the role of the public schools, but nevertheless has implications for higher education. Many of its recommendations were incorporated in PL 88-210, the Vocational Education Act of 1963.

74. ________________, Guide to Organized Occupational Curriculums in Higher Education, Institutional Data. OE-54012-62. Washington, U.S. Government Printing Office, 1962.

Based on data supplied by the institutions themselves to the USOE, this booklet lists by state and by type and level of curriculum the current 1962 enrollment in, and the 1959-60 and 1961-62 graduates from, organized occupational programs in higher education institutions in the United States. It is an excellent source of statistical information, with the weakness that it is now outdated. The summary shows that for the college year 1961-62 there were 53,272 graduates of all organized occupational curriculums in higher education. For the fall of 1962 there were reported 274,725 enrollments in occupational education curriculums.

75. ________________, Occupational Criteria and Preparatory Curriculum Patterns in Technical Education Programs. OE-80015. Washington, U.S. Government Printing Office, 1962.

An attempt to determine job demands and to set guidelines for curriculum development for technical education related to industry. A good basic source for preliminary planning of technician programs in post-high school institutions.

76. ________________, "Technical Education Program Series: Suggested 2-Year Post High School Curriculums." Washington, U.S. Government Printing Office.

The series includes the following titles: Electrical Technology, Electronics Technology, Mechanical Technology, Civil Technology, Chemical Technology, and Instrumentation Technology. The booklets describe job requirements, suggest curriculums, describe content and level of courses, suggest instructional materials, and give lab/shop layouts. They are extremely useful for institutions beginning technical programs in the areas covered.

78. ________________, Technical Training in the United States. Appendix I to Education for a Changing World of Work. Bulletin OE-20022. Washington, U.S. Government Printing Office, 1963.

A thorough study by Lynn Emerson of the status of technical education in the United States in the early 1960's.

79. University of The State of New York, Technicians For The Health Field: A Community College Health Careers Study Program, by Robert E. Kinsinger and Muriel Ratner. New York, State Education Department, March, 1966. 52 p.

A report on a 15-month study of the semiprofessional health technologies in New York State. Statements of objectives and performance standards were prepared for the following health technologies: X-ray technician, inhalation therapy technician, dental auxiliary, medical record technician, occupational therapy assistant, surgery technician, biomedical engineering technician, ophthalmic dispenser (optician), public health technician, and medical emergency technician. Included also is a discussion of plans for teacher education to staff such educational programs.

Publications of United States Government Agencies: U.S. Department of Labor, National Science Foundation, etc.

80. National Science Foundation, Scientists, Engineers, and Technicians in the 1960's: Requirements and Supply. NSF 63-64. Washington, 1964. 68 p.

Current and future projected demands for scientists, engineers, and technicians are carefully analyzed. Then the same methodology is applied to the problem of current and future supply of workers in these occupational categories. The forecasts and comment sections are supported by many pages of tables, charts, and statistical data. This is perhaps the best current, single source of information for educators interested in the supply and demand situation in technical manpower categories.

81. ______________, "Summaries of Studies Concerning Scientific and Technical Manpower and Education, As of June, 1965." Washington, October, 1965. 70 p. Multilithed.

A compilation of recently completed and then (1965) current studies being conducted across the broad front of scientific and technical manpower problems.

82. ______________, The Long Range Demand for Scientific and Technical Personnel: A Methodological Study. NSF 61-65. Washington, 1961. 84 p.

A carefully structured study for the National Science Foundation by the Bureau of Labor Statistics, U.S. Department of Labor, it gives ratios of technicians to scientists and engineers in both public and private sectors of the economy. It also gives projections to 1970 for technical personnel in manufacturing, chemicals, electrical equipment, and other fields.

83. U.S. Department of Labor, Career Guide for Demand Occupations. Washington, U.S. Government Printing Office, 1965. 40 p.

This brings up to date the original Career Guide for Demand Occupations released in 1959. Its purpose is to provide counselors with information about occupations that are in definite demand in many areas of the nation and that require pre-employment training. Many of these occupations require college-level education and training. It is available through the Bureau of Employment Security, U.S. Employment Service.

84. ______________, Careers for Women Technicians. Women's Bureau Bulletin 282. Washington, 1962. 28 p.

A brief survey of the opportunities available to women as technicians in the support of scientific, engineering, and research activities in industry and government.

85. ______________, Educational Attainment of Workers, March 1964, by Denis F. Johnston. Special Labor Force Report No. 53, reprint No. 2463 from Monthly Labor Review, May, 1965. Washington, Bureau of Labor Statistics, 1965.

This bulletin reprint contains exceedingly valuable statistical and

interpretive data on the educational trends evident in the work force in recent years. Major section headings include: "Education and Employment Status," "Education and Occupation," "Labor Force Participation," "Education and Income," and "Education and Labor Demand." Detailed statistical tables follow the analytical sections.

86. _______________, *Manpower Implications of Automation*. Washington, Manpower Administration, Office of Manpower, Automation, and Training, 1965. 86 p.

This consists of papers presented by staff members of the U.S. Department of Labor at the O.E.C.D. North American Regional Conference on Manpower Implications of Automation held in Washington, December, 1965. Major sections deal with such topics as: "Technological Change, Productivity, and Employment," "The Pace of Technological Change," "Effects of Technological Change on Occupational Employment Patterns in the U.S.," "Effect of Technological Change on the Nature of Jobs," "Labor Force Adjustments Affected by Technological Change," and "Implications for Government-Sponsored Training Programs."

87. _______________, *Manpower Needs by Industry to 1975*, by Howard Stambler, Reprint No. 2462 from *Monthly Labor Review*, March and April, 1965. Washington, Bureau of Labor Statistics, 1965.

Forecasts for the next decade of manpower needs among the standard occupational classifications used by the Bureau of Labor Statistics and among the types of industries in the BLS standard classification.

88. _______________, *Manpower Report of the President: A Report on Manpower Requirements, Resources, Utilization, and Training*, Washington, 1966.

Issued yearly in March, as required by Section 107 of the Manpower Development and Training Act of 1962. The information is current and useful in educational planning. Recent emphasis, however, has been on *unemployment*, the disadvantaged, Job Corps and Youth Corps programs, the War on Poverty, etc. Consequently it is perhaps fair to say that the report's greatest usefulness is outside the "mainstream" of educational effort in the public schools and in colleges.

89. _______________, *Occupational Outlook Handbook*, 1966 edition. Washington, Bureau of Labor Statistics, 1966.

This handbook gives information on employment outlook, earnings,

working conditions, education and training, paths to promotion, and regional opportunities for nearly 800 different occupations. Many of the occupations treated are in technical-vocational fields which require post-high school education and training.

90. ________________, *Occupations in Electronic Computing Systems*, Washington, Manpower Administration, Bureau of Employment Security, 1965. 72 p.

This survey explains the theory of a computer approach to the solution of business and research problems and identifies the levels and titles of jobs in the field and discusses the educational requirements.

91. ________________, *Selected Occupations Concerned with Atomic Energy*. Bureau of Employment Security No. E-197. Washington, 1961. 57 p.

A brief analysis of the peaceful uses of atomic energy is followed by a detailed discussion of occupational opportunities in the field. Job clusters and job specifications are explained and the educational requirements are outlined. A selected bibliography is included.

92. ________________, *Technician Manpower: Requirements, Resources, and Training Needs*. Bureau of Labor Statistics, Bulletin No. 1512, Washington, 1966. 111 p.

The report of a comprehensive research study of current and future projected technician manpower, conducted by BLS with support of the National Science Foundation. A total employment of technicians in 1963 of 845,000 is expected to grow to about 1.5 million by 1975. In addition, almost half of the 1963 technicians will have to be replaced as a result of attritional factors such as death, retirement, and transfers to other kinds and levels of jobs. Appendices include statistical tables, sample technician training programs, and a selected bibliography.

Selected Articles, Periodicals and Journals

93. "A.S.E.E. Committee Report on Student Selection and Guidance." *Technical Education News*, vol. 16, p. 16. 1956.

94. Buckingham, Walter, "White Collar Automation." *The Nation*, vol. 194, p. 10-12. January 6, 1962.

95. Drucker, Peter, "Education in the New Technology." *THINK Magazine*. June, 1962.

96. "ECPD and ASEE: What They Are and What They Do." *Technical Education News*, vol. 22, p. 1-2. June, 1963.

97. Fuchs, Victor R., "Fallacies and Facts About Automation." *New York Times Magazine*. April 7, 1963.

98. Harris, Norman C., "A Special Role in Engineering Education." *Junior College Journal*, vol. 33, p. 8-12. April, 1963.

99. ________________, "Major Issues in Junior College Technical Education." *Educational Record*. Spring, 1964.

100. ________________, "Redoubled Efforts and Dimly Seen Goals." *Phi Delta Kappan*, vol. 46, No. 8. April, 1965.

101. ________________, "The Role of Physics in Technical Education." *Technical Education News*, vol. 13, p. 1-3. April, 1955.

102. Henneman, H. A., "Agricultural Technician Training Is No Fantasy." *American Vocational Journal*, vol. 37, p. 14-15. March, 1962.

103. Johnson, Richard A., "Office Workers--How Will Automation Affect Their Careers?" *Advanced Management--Office Executive*. February, 1962.

104. *Journal of Engineering Education*.

The ASEE has an active interest in technical institute-type education, and the journal often carries articles on technical schools and technical curriculums. For example, the Special Issue of November, 1966, features the engineering technician--his work, his education, and his niche in the middle manpower spectrum. Address: American Society for Engineering Education, Dupont Circle Bldg., 1346 Connecticut Ave., N.W., Washington, D.C.

105. *Junior College Journal*.

The major publication representing the junior colleges of America, public and private, it contains frequent articles on occupational education. For example, the March, 1963, issue featured health occupations education, and the April, 1963, issue stressed engineering technical education. Address: American Association of Junior Colleges, 1315 16th St., N.W., Washington, D.C.

106. Kurtz, Margaret, "Technical Secretaries." Junior College Journal, vol. 33, p. 25-26. May, 1963.

107. Light, Israel, "Training for Health Occupations." Junior College Journal, vol. 33, p. 16-21. March, 1963.

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REACTIONS

In order for this second series of "New Dimensions in Higher Education" to better serve the needs of colleges and universities throughout the nation, reader reaction is herewith being sought. In this instance, with respect to Developments in Technical and Vocational Education, the following questions are asked:

1. Can you suggest other completed research or experiences, the results of which would add significantly to this report?
2. What problems related to this subject should be given the highest priority, in terms of further research?
3. What suggestions, if any, do you have for the United States Office of Education in regard to its programs in vocational and technical education at the post-high school level?

Kindly address reactions to:

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